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H. BURGESS, CAPTAIN,
Secretary.

WHITEHALL YARD,

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Friday, January 18, 1889.

GENERAL THE RIGHT HON. VISCOUNT WOLSELEY, K.P., G.C.B.,
G.C.M.G., Adjutant-General to the Forces, in the Chair.

QUICK-FIRING¹ GUNS FOR FORTRESS DEFENCE.

By Captain F. GLEADOWE STONE, P.S.C., R.A. (Instructor of Fortification R.M. College; Royal Art. Inst. Prize Medallist, 1888).

THE defence of fortresses may be divided into that of sea-fronts and land-fronts; as a maritime nation and great naval Power, we are more immediately interested in the former.

It is a generally accepted principle in adopting any particular line of defence, to be guided by the resources and probable plan of attack of one's adversary—the resources of our enemies are probably as well known to us as ours are to them; but as regards a probable plan of attack upon any of our fortresses or coaling stations, there seems to be a wide divergence of opinion. A writer in the "Edinburgh Review" says: "The tactical condition of the 'battle fleet' is such, that giving the ships to an Admiral to arrange in fighting order, must be something like giving boiled eggs to a cook to make an omelette of."²

The question is, indeed, of so complicated and difficult a nature that the gold medal of this Institution for 1888, for the best essay on the subject, was not awarded; I trust, therefore, that I, as a landsman, may be pardoned if I avoid plunging deeply into waters which naval experts have as yet scarcely fathomed.

In naval strategy we also find a divergence of views, though in this latter case we have more solid data to go upon. It has been argued by Admiral Colomb that the principles which guided Lord St. Vincent, in 1801, are applicable to the present day, and that salva-

¹ The distinction between Q.F. guns and machine-guns is that the former fire shell with bursting charge, the latter only firing bullets.

² "Edinburgh Review," October, 1885.

tion is only to be found in naval blockade.¹ We find some going further and declaring that fortified sea-fronts are not necessary if the Navy is strong enough to efficiently blockade the enemy's ports—others, while admitting the impossibility of an efficient blockade in the presence of steam, and regarding the fortification of naval arsenals, dockyards, and coaling stations as a necessity, appear to think that the rôle of the fleet is essentially defensive; others, again, and these apparently form the bulk of uneducated popular opinion, would fondly hug the Navy close to our own shores, calling it "our first line of defence." Lookers on proverbially see most of the game, and probably military men are the most deeply interested and least prejudiced of observers in matters naval, naturally desiring that the sister Service may be kept in the most efficient state possible, and that its efficiency may on all occasions be turned to the best account. My premiss is that the possession of naval arsenals, dockyards, and coaling stations must practically decide the question of naval supremacy; that such supremacy is absolutely essential to our existence as a nation; and that the way to secure it is to fortify and arm our own arsenals, dockyards, and coaling stations in such a fashion as to enable them to resist an enemy's attacks, and at the same time to give a free hand to the Navy to attack those of the enemy with such force as may be available, after providing for the patrolling of our principal trade routes (see Table B), and the formation of such fleets as may be considered necessary to enable us to force on a naval engagement when opportunity offers, with forces adequate to inflict a crushing and decisive blow on the enemy. The following table is an extract from the French Official Aide-Mémoire for Naval Officers.

Our extreme vulnerability as a naval Power in the days of sailing ships, when our strength by sea in proportion to that of other European Powers was infinitely greater than it is now, may be gathered from the fact that between the years 1793 and 1800 no less than 4,314 British ships were captured.²

Lloyd's register shows that nearly 700,000 British ships enter or leave our home ports annually; that the value of this shipping is 93,000,000*l.*; and that the value of the imports and exports is 618,000,000*l.*, no less than 140,000,000*l.* of the imports being food.

"The strategical problem for England's fleet is how to keep open her numerous lines of communication, and yet to be in commanding strength at the important naval points and stretches of coast. Major Wachs points to the unprotected state of many of our coaling stations, and to the absence of dockyards in the southern hemisphere, *both as indispensable to a fleet as reserves and supplies are to an army.*"³

Here we have the key of the situation: our own docks and coaling stations must be sufficient for the purpose in view, and not only capable of taking care of themselves but also able to afford protection

¹ "Journal, R.U.S.I.," vol. xxxii, No. 144.

² "Naval Chronicle" for 1807.

³ Sir Gerald Graham, "Journal, R.U.S.I.," vol. xxxi, No. 142, p. 1033.

TABLE B.

Fast Cruisers of England, France, and Russia (speed 18 knots and over).

England. ¹	France.	Russia.
Protected cruisers— Mersey, 18. Severn, 18.1. Thames, 18.3.	Cruisers— Tage, 19. Milan, 18. Forbin, 19.5.	Torpedo cruisers— St. Iljui, 20.1. Capt. Sacken, 20.
Belted cruisers— Aurora, 19. Australia, 18.8. Immortalité, 19.5. Narcissus, 19. Orlando, 19.2. Undaunted, 19.3. Mercury, 18.6.	Torpedo despatch boats— Bombe, 18. Couleuvrine, 18. Dague, 18. Dragonne, 18. Flecha, 18. Lance, 18. Saint-Barbe, 18. Salve, 18.	Gunboat cruisers— Cervo Moretz, 20. Donetz, 20. Kubanitz, 20. Moretz, 20. Orletz, 20. Laporatz, 20.
Torpedo despatch boats— Grasshopper, 19. Rattlesnake, 19. Sandfly, 19. Spider, 19.		
Total launched. 14	11	8
Protected cruisers— Magicienne, 19.7. Marathon, 19.7. Medea, 20. Medusa, 19.7. Melpomene, 20.	Cruisers— Cecille, 19. Alger, 19. Isly, 19. Jean Bart, 19. Mogador, 19. Davoust, 20. Suchet, 20. Cosmao, 19.5. Coëtlogon, 19.5. Lalande, 19.5. Surcouf, 1.95.	Apparently none of this class being built in Russia at present.
Torpedo despatch boats— Salamander, 21. Seagull, 21. Sharpshooter, 21. Sheldrake, 21. Skipjack, 21. Spanker, 21. Speedwell, 21.		
Total building 12	11	

to all ships which may require a temporary harbour of refuge from whatever cause arising; the enemy's harbours, docks, and coaling stations must be seized or blockaded; and our lines of communication patrolled by fast cruisers. It does not enter into the scope of

¹ Admiral Fremantle gives "Mersey" and four others at 18 knots, in addition to this list, "Journal, R.U.S.I.," No. 143, 1883, but I cannot identify them.

this paper to discuss the inadequacy of our telegraphic communication to such places as Bermuda, Ascension, St. Helena, Gold Coast, Mauritius, &c., or to enlarge upon the insufficiency of our Navy for the duties it will have to perform in the event of war: my main contention is that the command of the sea in the present day practically depends upon the possession of harbours, docks, and coaling stations; that in peace-time we must render our own coaling stations, &c., secure against naval aggression, and that upon the declaration of war one of the first duties of our Navy will be to attack the enemy's military ports, dockyards, and coaling stations, and thus secure heavy odds in our favour from the outset. In order to secure the greatest results, the rôle of our Navy must be essentially offensive, and it is much to be regretted that an unreasonable dread of bombardment should have been aroused recently by the naval manœuvres, tending to form an uneducated public opinion in favour of keeping our fleets in home waters in any national emergency. Bombardment is an operation which requires a vast expenditure of ammunition and a considerable time to be effective, and the material damage inflicted is by no means proportionate to the cost of the undertaking, or to the risk incurred in carrying it out.

It is essential that the Navy should have a free hand for maritime operations, of a more or less offensive character, and that the fallacy of imagining that our commerce can be carried on by a mere transfer of flag should be clearly exposed. The following extract from Hall's "Treatise on International Law" will show to what extent we can rely upon the good offices of neutral Powers in this respect. The countries mentioned grant their flag as follows:—

Austria to ships owned by Austrians, the Captain and two-thirds of the crew being of Austrian nationality.

Belgium to ships which are five-eighths Belgian property.

France does not recognize the validity of sale of ships by belligerents to neutral Powers, subsequent to the declaration of war.

Germany to ships exclusively German.

Italy to ships officered by Italians, three-fourths of crew being Italian subjects.

United States to ships built in America, captured in war, confiscated for breach of federal law, or bought after shipwreck and repaired to the extent of two-thirds of their value by American citizens.

I will venture to touch upon one more naval question, and that is the question of blockade. It has been stated that to spend money on land defences while our Navy is admittedly insufficient in numbers, strength, and speed for the duties it will have to perform, is an altogether mistaken policy; and further, that if our naval strength were increased as it ought to be, there would be little or no necessity for any land defences at all, inasmuch as the enemy's ports could be so efficiently blockaded that our shores, our commerce, our Colonies, and coaling stations would be as free from hostile enterprises as they

are in peace-time. Our recent experience of naval blockade, when the "Warspite," "Severn," and "Iris" escaped from Berehaven, and united at a rendezvous off the Hebrides, with the "Rodney" from Lough Swilly, would seem to indicate that the game of naval blockade is likely to be a dangerous and unprofitable one for the blockader, and that the blockading squadron might employ its superior strength to better purpose, and more in consonance with the fighting traditions of the British Navy, by attacking and seizing the enemy's ports and coaling stations, and thus forcing on a decisive naval engagement.

It will, I trust, be granted that the Navy has its own sphere of action, quite apart from the *defence* of ports and coaling stations, and that this duty must rest principally with the land forces. Mr. Stanhope's Committee divides the defence of a port into two parts, "the active and the passive: the active, which is in most countries assigned exclusively to the Navy, includes the provision of gunboats, torpedo-boats, and in some few cases of harbour ironclad ships.

. . . . The passive defence, which is in this country assigned to the Army, includes submarine mines, quick-firing guns to protect the mine fields, and batteries of heavy guns." In the cases of Portsmouth, Plymouth, and the defences of the Thames and Medway, the ports should be protected not merely against chance cruisers, but against the attack of an ironclad fleet. In the case of the mercantile ports the Committee says: "The most probable danger to be apprehended is not a direct attack upon the ports, *provided that they are placed in a reasonable state of defence*, but that armoured cruisers will be sent to watch the lines of our commerce converging upon them, and to intercept and destroy merchant vessels. Where mercantile ports are situated at some distance up a river, submarine mining defence will in general afford a very great protection. The Committee think it essential that wherever this is adopted, the mine fields should be protected by *quick-firing guns*." I shall endeavour to show, 1stly, what the actual rôle of Q.F. guns should be, and, 2ndly, how their extensive employment may be the means of adding to the efficiency of our defences at a much less cost than could be secured in any other way.

Let us suppose that an enemy's fleet has succeeded by aid of superior numbers or clever manœuvring in driving one of our fleets or a portion thereof to take refuge under the guns of Plymouth, there to refit, coal, and await reinforcements; it is not unnatural to suppose that a large amount of merchant shipping would at the same time be locked up in the harbour. In such a case, the enemy would at once make the most of the temporary advantage which he had secured; he would shell the forts from his ironclads and gunboats, despatch torpedo-boats and cutting-out parties against our war ships, and burn, sink, or capture our merchant ships to the utmost limit of his power; further than this, he would possibly attempt to seize some of the forts and disable the guns; it is not inconceivable that a determined attack by sea upon Plymouth might go hand in hand with a landing in force at Brighton or possibly a daring attempt to seize

the Bristol Channel, which in its present undefended state offers a tempting bait for an enemy's cruisers.

Let us deal first with the enemy's ironclads; we have unfortunately but little information to guide us as to what the fire effect of an iron-clad squadron is likely to be upon a well-defended and protected sea-front, but from the experience of the French at Sfax, and our own experience at Alexandria, it would appear that, so far as the artillery duel is concerned, the guns on shore are likely to have the best of it. "At Sfax, after a remarkably deliberate fire of 2,002 projectiles, delivered under peace-practice conditions, the defensive power of the place is reported to have been practically uninjured."¹

At Alexandria, Fort Meks, a work of antique construction, armed with five heavy R.M.L. guns, nine S.B. guns, and five mortars, was engaged by the "Monarch," "Penelope," and "Invincible" at 1,200 yards, and the "Téméraire" at 3,500 yards, for nearly four hours, during which time the "Inflexible" joined in for an hour at 3,800 yards; during this period not a single Egyptian gun was disabled, and only two were touched, though altogether 580 heavy and 340 light projectiles had been discharged. On the other hand the "Invincible" was hulled fifteen times and the "Penelope" eight times, in addition to receiving a round shot in one of her ports. Captain Clarke, R.E., commenting upon this action, writes: "If the gunners (*i.e.*, the Egyptian) had been able to handle the R.M.L. guns as well as they did the S.B., and if the armament had been supplemented by a few machine and Q.F. guns on the flank, the ships would have been defeated without any difficulty."²

There is little doubt that we are disposed to rate the fire from big guns on board ship too highly, not only as regards accuracy, but also as to its probable effect: a ship's guns engaging a shore battery labour under two great disadvantages—

- i. The unstable platform from which they are fired.
- ii. Necessity for engaging the shore battery at long ranges in order to compensate to some extent for the superior command of the shore guns.

It has been proved on many occasions that a shell striking the superior slope of a parapet with a horizontal trajectory will do no damage to the revetment, and the splinters will be deflected clear of emplacement.³ Similarly a shrapnel burst on the very crest would do little damage if its trajectory were horizontal. The following table will illustrate the necessity for increasing the range according to the superiority of command of the shore battery in order to obtain a given angle of descent:—

¹ "Protection of Heavy Guns for Coast Defence." Capt. G. S. Clarke, R.E.

² "R.A.I.," February, 1887.

³ Eastbourne experiments.

10" M.L.R. Gun. Charge, 70 lbs. Muzzle vel., 1,364 f.s.

Height of shore battery above plane.	Ranges in yards, necessary to secure the following angles of descent.				
Feet.	Horizontal.	2°.	4°.	6°.	8°.
100	1,050	1,650	2,350	3,000	3,580
200	1,460	1,970	2,560	3,180	3,740
300	1,750	2,230	2,780	3,350	3,880
400	1,980	2,440	2,970	3,480	4,000
500	2,170	2,620	2,130	3,620	4,100

Taking Colonel Nicholson's formula for the cone of dispersion of shrapnel, we find that in the case of the shrapnel for the above gun, the average semi-angle of opening is about 5° between the ranges of 2,000 yards and 4,000 yards; so that the extreme angle of descent of the shrapnel bullets at a range of 3,000 yards, when fired at a shore battery only 100 feet above plane, would be 11° or about $\frac{1}{2}$.

The shore batteries on the other hand have the advantage of command and stability of platform, they are secure from the distractions caused to the ship by torpedo-boats, and the fire of the guns can be controlled even in the most widely dispersed batteries by the Watkin position-finder. A brief description of this instrument, or rather of the method of working it, will at once make clear the enormous advantages which accrue to the defence from its use. Conning-towers and observing-rooms are established in suitable positions, usually one on each flank, each room being provided with a position-finder; the guns are grouped for action and simultaneous electric firing under the control of the observing-rooms, which are in telegraphic communication with each group, and in special electric connection with the position-finding signals of each group; these signals show the training and elevation required at any given moment on a dial. The observing-room which is most suitable on account of the direction of the wind is selected to control the firing, and all orders, signals, &c., communicated from it. The vessels to be engaged by each group of guns are now singled out, and an observer at each position-finder keeps a telescope, with the crosshairs always on the ship to be fired at. An officer watches a plan of the defended waters, on which two pointers move automatically, in accordance with the movement of the telescopes. The intersection of the pointers gives exactly the quadrant elevation and training required for each group. The ship's course and speed being indicated on the plan, it is easy to signal to each group the required laying a minute or so ahead, the signal is read off the dial in the battery, and the gunners have merely to carry out the mechanical duties of traversing and elevating, without requiring to see what is going on outside; when these duties are completed, the electric firing-wire is connected up, the

battery signals "ready" to the observing-room, and the officer in charge can exactly time the fire of the group so as to strike the ship without fail whatever pace she may be going at.

By the aid of quick-firing guns and the position-finder we are enabled to carry out the ideal system of defence, viz., few guns in dispersed emplacements concealed by natural features. This system has long been advocated by Sir Andrew Clarke, and it is difficult to see how any further opposition can consistently be offered to it.

The very meagre results which long-range howitzer fire is likely to attain against such a system of batteries may be gathered from the fact that at 3,000 yards range, the 8-inch howitzer with $11\frac{1}{2}$ lbs. charge is estimated to pitch 50 per cent. of its shells within a vertical rectangle 114 feet in length and 25 feet in height, the angle of descent being

$12^{\circ} 24'$ (Table A), or $\frac{1}{44}$. This is certainly the minimum range at

which a ship's gun could engage an elevated shore battery with any hope of success as regards "searching effect," and any attempt to move in closer, in order to improve the accuracy of the howitzer fire, would be done at the sacrifice of a large amount of gun fire from the ships and the risk of utter destruction to men and material from the Q.F. guns on shore.

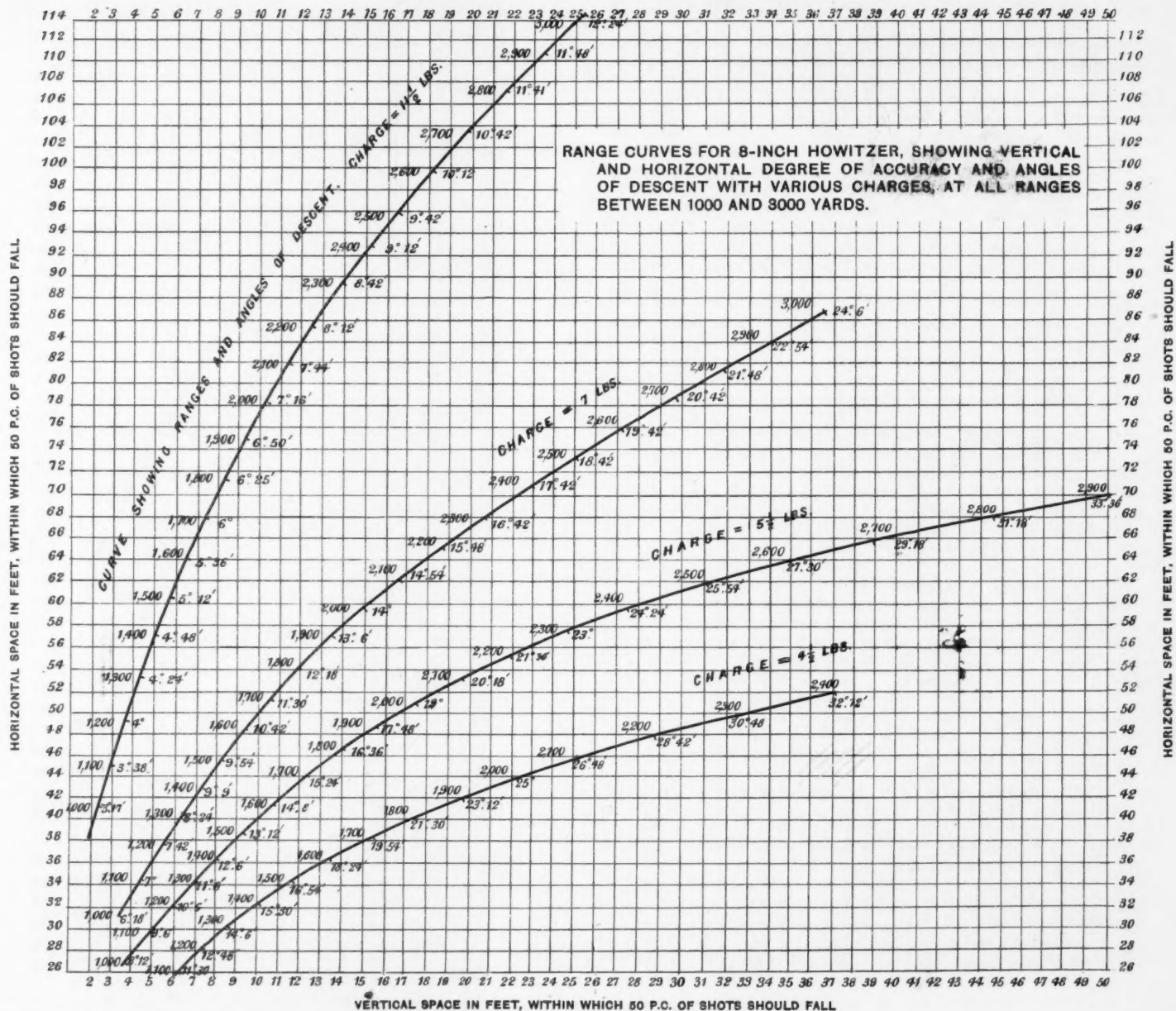
It is to be presumed that we shall have a complete system of submarine mine defence at all our naval ports. Mr. Stanhope's Committee specially recommends this kind of defence for harbours lying some little way up a river, such as Liverpool, and at the same time points out the necessity for protecting the mine fields in every case by Q.F. guns. In the attack of any port or harbour, the question of removing the defender's mines has to be considered before anything in the shape of a decisive action can be fought. The mines may be removed by "sweeping," "creeping," or countermining; all these operations are more or less tedious and dangerous, and would be rendered absolutely impossible under the fire of Q.F. guns; countermining at night appears to be most in favour in the Navy, but where the electric light is able to illuminate the mine-fields, such an operation would very soon cease to be attractive. The assailant will probably in the end form an inshore squadron of gun and torpedo boats, and organize boarding, landing, and cutting-out parties. Attacks by day and surprises by night will be attempted, and the defence will be severely tried; the only reliable defence against the assailant's inshore squadron will be the extensive employment of Q.F. guns of sufficient calibre, not merely to annihilate landing or boarding parties, or to send a torpedo-boat to the bottom, but equal to the task of putting a gun-boat *hors de combat*, and either wrecking her or making it possible for the active harbour defence to capture her. Quick-firing guns, whether made on the Hotchkiss, Armstrong, or Nordenfolt principle, or on the automatic Maxim system, are practically *non-recoiling*; thus there is an immense advantage gained not merely by the mechanical or automatic breech-closing arrangements, but also an immense gain in time owing to the absence of recoil, and the avoidance of the necessity for relaying after every shot when firing at a stationary or



TABLE A.

VERTICAL SPACE IN FEET, WITHIN WHICH 50 P.C. OF SHOTS SHOULD FALL

Plate 1.



nearly stationary object. Thus a 3-pr. Q.F. gun (Maxim), firing twenty rounds in a minute (which is about half its maximum rate),¹ throws the same aggregate weight of shell as a 64-pr. M.L. gun is capable of discharging in the same time; it has, moreover, a penetration of 4 inches into armour-plate, while the effect of successive rounds striking the same spot would be difficult to estimate; it may, however, be noted that any kind of armour built up in segments, such as that of a Gruson turret, is affected most seriously by being struck two or three times in the same place.² Moreover, the results obtained as regards the penetration of the shells of our new high velocity guns are notoriously unreliable; the shell usually turns off into the line of least resistance, and it seems fair to conclude that a rapid succession of comparatively small projectiles striking the same spot will produce a greater effect than the impact of a single very heavy projectile. At Alexandria, a shell from the 80-ton gun of the "Inflexible" penetrated only 20 feet into sand at a range of 2,000 yards, and at Eastbourne an 8-inch Palliser shell penetrated only 6 feet into a loam parapet at 1,200 yards.

At some competitive trials carried out last year by the Admiralty between a 4½-inch Q.F. gun and a 5-inch Service B.L. gun, the former fired ten consecutive aimed rounds in forty-eight seconds, while the latter took five minutes seven seconds to fire the same number.³ It does not appear necessary that Q.F. guns for this kind of defence should be of very large calibre; probably a 5-inch gun, throwing a projectile of about 40 lbs., would be the maximum required, giving a penetration of 12 inches into wrought iron.⁴ Any attempt to go beyond this for the purpose of obtaining higher penetration would be misplaced, though doubtless quite feasible; in fact, a 12-pr. Q.F. gun would serve most purposes, and the results already achieved by the 6-pr. Hotchkiss are instructive on this point; at Eastbourne a shell from one of these guns struck the chase of a 10½-inch B.L. gun and penetrated into the bore; at Shoeburyness a 9½-inch B.L. gun was struck on the chase and a bulge of nearly half an inch raised on the interior of the bore, thus rendering it unserviceable. There can, therefore, be no question that these guns are sufficiently powerful to cope with an inshore squadron of gun and torpedo-boats, they have, moreover, the immense advantage of being susceptible of rapid correction for laying and being capable of following up a moving object with continuous fire; thus we will suppose a torpedo-boat advancing to within 400 yards of a shore battery of Q.F. guns, in order to discharge its torpedo against some of the shipping in the harbour: the boat advances at the rate of, say, 20 miles an hour, and the Q.F. guns on shore open fire at 1,000 yards range: the dangerous zone for the

¹ This gun has fired 70 *unaimed* rounds in a minute; the deduction to be made for aimed rounds must necessarily vary according to circumstances: it may, however, be taken as a general rule that two consecutive *aimed* shots could be fired in two seconds by a trained man.

² At Buchan a single segment of a Gruson turret broke up under four closely adjacent hits from a 12-inch gun. "R.A.L." vol. xv, p. 182.

³ Penetration of 4½-inch Q.F. gun into wrought iron = 10½ inches.

⁴ Penetration of 5½-inch Q.F. gun into wrought iron = 15 inches.

boat to cover in its advance is therefore 600 yards, and this would be accomplished in about one minute: this enables a 12-pr. or 14-pr.¹ Q.F. gun to fire from sixteen to twelve aimed shots, and gives the torpedo-boat very little chance if it has to run the gauntlet of rapid fire from a battery of four to six of these guns. What chance would the best ordinary B.L. gun have in such a case? At the very outside it could not put in more than two aimed shots, and the knowledge that the race against time was in favour of the boat would inevitably flurry the gunners and minimize the chances of a successful shot.

It seems to be within the bounds of probability that at close ranges, with a fair amount of training and practice, a gunner could learn to fire at a moving object with his Q.F. gun, on the same principle that a sportsman fires at driven partridges, and the conscious process of *laying* be merged in the instinctive and rapid *snap shot*, all the lighter natures being fitted with a shoulder piece, and free to move in any direction at the will of the firer.

Boarding, landing, and cutting-out parties could be opposed with the greatest certainty of success, the rifle calibre machine-gun supplementing and taking the place of the Q.F. gun, as soon as destruction to material was no longer desired.

There are two objections commonly raised to the employment of Q.F. guns: (1) The smoke, (2) complicated mechanism and liability to get out of order. With regard to the first point; if the smoke hangs over any gun, it is impossible to lay it, but in the case of the Q.F. gun, we can at any rate get in more shots than with the ordinary gun, inasmuch as the laying is not disturbed;² besides which, the fact of our powder being bad (as regards smoke) is no argument for discarding all improvements in gun-making, and apparently we are in a fair way to getting over this difficulty if we may rely upon what Mr. Stanhope said on November 1st at the Holloway Hall: "The progress which might be desired has not been made in the use of high explosives, but many trials have been made, and the Government now see their way to the introduction of an explosive for use with big guns, the effects of which are described as extraordinary." Mr. Stanhope does not inform us whether this explosive is to be used as a propelling agent, or if it in any degree obviates the smoke difficulty; but I believe the Chilworth Company have in some measure succeeded in obtaining good results, while a firm of gunmakers are within measurable distance of emulating the results recently obtained by the French. An eye-witness, describing the firing of the Maxim automatic machine-gun in France with smokeless and noiseless powder, told me that as he stood out on the range watching the results of the silent and invisible discharge from this weapon, the effect was truly appalling, and of a character to shake the nerves of the stoutest hearted.

With reference to the second point, I cannot help thinking that we are too ready to raise objections to new inventions on the score of complication, and to overlook the delicacy and liability to injury

¹ Penetration of 14-pr. Maxim-Nordenfelt Q.F. gun into wrought iron = 8 inches.

² Of course *all* guns are rendered independent of smoke, by the position-finder.

which exist in our own Service patterns of guns: probably the reason is that we hear nothing of the failures in our own gun factories; whereas any new invention from extraneous sources is not only put through its paces pretty severely before being adopted into the Service, but the experiments are eagerly watched by a host of hostile critics, and the results made known to the whole world; the natural tendency appears to be to look out for defects rather than to discover the good points, and this in a measure is very desirable, just as Her Majesty's Opposition is desirable, but at the same time, in questions of really national importance, we should strive to divest ourselves of all party feeling and prejudice, and frankly acknowledge and turn to the best account whatever is for our country's good, no matter from what source it may emanate. It does not appear to occur to those who habitually range themselves on the side of the opposition, that our new B.L. guns can be put temporarily out of action by a single bullet burring the thread of the screw on the breech-block, nor do they seem to realize that the terrific sandstorm which is supposed to rage perennially around a machine-gun, as evidenced by the severity of the *sand-test*, would be equally detrimental to the breech-closing apparatus of the magnificent guns of which our Royal Gun Factory has reason to be so justly proud. The following table will open the eyes of many to the fact that few guns are infallible, and that the occasional breakdown of ordnance of all descriptions is a contingency to be reckoned with, and not necessarily a reason for sweeping condemnation of any particular manufacture or design whether it emanates from Woolwich or from a private firm.

Guns which have Fired over 250 and under 1,200 Rounds, with the number of each Class Condemned or Repaired.

	R.M.L.			
	10-inch.	11-inch.	12-inch.	12·5-inch.
Fired	40	4	4	5
Condemned or repaired ..	14	—	3	2

	R.B.L.		
	4-inch.	7-inch Armstrong, old pattern.	16-inch.
Fired	19	74	1
Condemned or repaired	7	8	—

Army Return (Guns), April, 1887.

With reference to the position of batteries of Q.F. guns in modern fortified sea-fronts, it appears that the highest and the lowest sites would offer the greatest advantages, the intermediate sites being retained for the existing armaments of heavy guns; and the somewhat heterogeneous collection of muzzle-loading guns of the older types which exist in some of our fortresses being made a clean sweep of, such guns not only lead to a false feeling of security and occupy valuable sites which might be better filled at a comparatively small cost, but they are a source of extreme danger on account of the complication of ammunition. In the case of batteries which have only two tiers of fire, and where it is considered desirable to retain the heavy guns near to the water-line, batteries of Q.F. guns might be placed on the flanks. The object of thus arranging the guns would be that the high level tier should be enabled to attack the decks and machinery of ironclads with plunging fire at a great comparative advantage as regards:—(1) Field of fire, (2) observation of fire, (3) accuracy, and (4) penetration; the guns of the ironclad being unable to reply effectively, except at long ranges with high elevation and curved trajectory: the ship guns could not fail to be more or less exposed, while the shore guns, inexpensively mounted *en barbette* in dispersed emplacements, would offer a mark which it would be almost impossible to hit.

The low tier intended solely to engage the enemy's inshore squadron would be on equal terms as regards flatness or rather horizontality of trajectory, but would have an immense advantage in rapidity of fire at critical moments, and also in the amount of cover which could be given them, for with comparatively light guns, there would be no difficulty in *muzzle-pivoting*, and their port-holes could consequently be reduced to a minimum. The flanking batteries would bring a cross-fire to bear upon any gunboats advancing directly on the fortress, and would very quickly dispose of any torpedo-boats before they had a chance of discharging their submarine projectiles.

It seems to me that the balance of advantage lies with the fortress, and that if the armament be satisfactory, and the men well trained, it will be able to fill its proper rôle in giving protection to our ships, whether they be ironclads come in to coal or refit, or driven in by superior force for shelter, or merchant-vessels seeking refuge or awaiting convoy.

The argument for Q.F. guns to protect mine-fields is of peculiar cogency, for if it be the case that the explosion of a submarine mine under an enemy's vessel would render the passage at that point impracticable for our own shipping, it becomes of supreme importance that a mine should be fired only as a last resource, the possibility of maintaining a safe channel for our own shipping unknown to the enemy being doubtful; a combination of submarine mine defence with batteries of Q.F. guns would be sufficiently formidable to check any rash enterprise against our commercial ports; and here again practice in peace-time is essential if we would avoid the risk of our ports being prematurely closed to our own commerce. It is

most satisfactory to note that Mr. Stanhope's Committee consider "that steps should be taken to afford additional opportunities for practice to all those who will have to take part in submarine mining operations in time of war." I trust that this recommendation may be acted on.

A certain amount of money has lately been voted for the defence of our ports and coaling stations, and everyone wishes that it may be spent to the best advantage, though naturally there are many conflicting opinions as to how this should be effected. Doubtless, there are some who are enamoured of the Bessemer scheme, and would like to see the skin of a fort built in fireproof brick, and furnaces erected for pouring in molten steel until the mould was full; there are others again who would make a clean sweep of all fortification, saying: "Give us ships, and we will do all that is required in every quarter of the globe." A sailor loves his ship, but I should imagine his gun had to put up with the second place in his affections, though sailors are proverbially large-hearted. Being a gunner, I am possibly prejudiced in favour of guns, and my contention is that to employ the Navy for coast defence is a mere waste of strength which we can ill afford, and would be bad policy if we could afford it; that any extensive elaboration of our complicated systems of permanent fortification is to lose sight of the end in constructing the means, and that what we do require for security in defence and potentiality for offence is a suitable armament of the best guns we can get mounted in dispersed and concealed emplacements, and a sufficient number of gunners trained up to such a point that the maximum effect may be obtained from the guns. A couple of well-placed earthen barbette batteries containing a dozen Q.F. guns might do more for the defence of any given position than the most approved casemated battery or turret mounting an 80- or 100-ton gun.

Mr. Anderson, C.E., stated his belief "that the Dover turret would be so damaged by a single 16-inch shell that it would be impossible to work it any more. The energy of one of the bolts of the "Inflexible" striking, say, at 2,000 yards range would be represented by the whole of the Dover turret, which weighs 750 tons, rising 16 feet into the air. Is it conceivable that no derangement would result from such a blow?"¹

The difference in the cost of pursuing such a system as I have attempted to lay before you, or of following the old lines of massive iron and masonry fortifications and colossal guns, may be conjectured when we remember that the cost of the 100-ton Armstrong gun was 16,743*l.*, the R.G.F. 13.5-inch gun of 67 or 69 tons was 10,859*l.* 12*s.* 7*d.*, the 80-ton M.L. 9.81*l.* 6*s.* 3½*d.*, and the 38-ton M.L. 3,199*l.* 8*s.* 0½*d.*²

When the cost of carriages, slides, transport, mounting, machinery, and protection is added to these figures, it may well make us pause

¹ "Journal, R.U.S.I.," 1884.

² Blue Book, April, 1887.

to consider whether we are spending our money to the best advantage.¹

Land-Fronts.

Thus far I have treated the question of fortress defence entirely from the sea-front point of view; the defence of land-fronts, though not of such pressing interest to us as a maritime Power, is, however, of vital importance, whether we consider the land defences of our great military ports, rejoicing in all the elaboration of permanent fortification, the proposed works for the defence of London, or the combination of old-fashioned permanent, and modern field fortification for the protection of our Indian frontier.

For many reasons we are not likely to enter upon the construction of large permanent works which, as General Hamley says, "are great drains on the resources of a country, expensive to construct, and expensive to maintain;" besides which, "a few" such works "will swallow up for their necessary garrisons armies that might turn the scale of a great war in the open field. The constant improvement in high explosives is another argument against undertaking permanent works of elaborate trace and immensely strong profile, provided with armoured batteries, which cannot hope to keep pace in the struggle for precedence with the ever-increasing power of shell-fire."²

History indicates that well-planned field works, aided by abundant resources in men and material, can be made quite as strong as permanent works. The celebrated case of the lines of Torres Vedras, which Wellington had "artificially fortified so as to be absolutely impregnable for many miles of their length the passes being defended with strong works armed with heavy artillery" (Hamley), is an instance of what can be done in the way of field fortification when the base is easily accessible.

The case of Sebastopol is even more instructive, affording as it does an actual parallel to cases with which we may ourselves have to deal in the event of an invasion of our territory. "Of permanent land defences on the south side of Sebastopol there were practically none. In the spring of 1854 steps were taken to protect the town loop-holed walls, barricades, and a few simple batteries gradually developed into a vast system of earthworks such as the world has never seen. By September the defences of the south side mounted 172 guns ready to oppose the 126 guns of the Allies in the first bombardment begun on the 17th October. It was expected that Sebastopol would fall after a short cannonade. The siege lasted 349 days, and at its close the Russians opposed 982 guns in the first line to

¹ The turret, mounting and machinery, exclusive of the guns, at St. Chamond, cost 3,000,000 francs (say 120,000*l.*), *vide* "La Fortification du Temps Présent." Brialmont, p. 300. Cost of Gruson cupola for two 6-inch guns = 7,500*l.*

² At Port Lobos a 6-inch howitzer throwing a shell containing 11 lbs. of explosive gelatine at a range of 1,100 yards, made a breach in a rock escarpment 6 feet deep and 25 feet in diameter; splinters being thrown to a distance of nearly 900 yards.

about 800 guns of the Allies. The case of a defender possessing a large reserve of guns, and whose operations were directed by a soldier of genius who knew how to use them, had not been taken into account."¹

The lessons which the Russians learnt before Arab Tabia in May and June of 1854, and again before Plevna more recently, appear to have established the fact that field works constructed on a proper system, and defended energetically, cannot be taken by assault, and that the regular siege must be resorted to in such cases just as inevitably as in the case of permanent works.²

The probable nature of the attack being thus established, let us consider in what degree the employment of Q.F. guns is likely to aid the defence. Sieges have usually commenced with the establishment of a number of batteries for the heaviest guns of the siege-train at distances regulated by the range of the ordnance employed; the object of these batteries is to engage the artillery of the defence and to subdue it to such an extent that the siege trenches may be pushed on without let or hindrance; the establishment of this 1st Artillery position exercises an important influence on the subsequent course of the siege, and any supineness on the part of the defenders at this stage of the operations will enable the assailants to establish their batteries in the most favourable positions, thus placing the artillery of the defence at a disadvantage from the very outset. The estab-

¹ "Land Fortification," Major Clarke, C.M.G., R.E., R.A.I., June, 1888.

² I do not wish to be understood to advocate *improvised* field works for the defence of important positions. The case of Torres Vedras was one of most elaborate preparation, with abundance of resources, and a secure base. In the case of Sebastopol, the work which was done *during* the siege ought to have been completed *before* the siege; very few troops would have borne the terrible losses which the working parties suffered, with the same imperturbable pluck as the Russians exhibited; no one recognized more fully than General Todleben the disadvantages of having to inaugurate and carry out his defensive works in the presence of the enemy. Plevna has furnished the advocates of *improvised* field fortification with a sort of catchword; but it was merely an instance of bad generalship on the part of the Russians, enabling the Turks to secure advantages which otherwise could only have been gained by previous preparation. The position was peculiarly favourable: Osman Pacha retired upon Plevna with 25,000 men, 18th July, 1877; the Russians, without preparation, attacked on the 20th July, with only 7,000 men. Immediately after their repulse, Osman took in hand the improvement of the fortifications, and reinforcements brought up his strength to 45,000; he was thus in a position to repel the second attack of the Russians on 30th July: he followed this up by an unsuccessful sortie on the 31st July. On the 11th September the Russians, having prepared the attack by a bombardment of four days, assaulted with 60,000 men, the garrison having in the meantime been increased to 60,000, and the fortifications brought to a high state of perfection. This assault, like those which preceded it, was unsuccessful, and the Russian losses having now amounted to 30,000 men, General Todleben advised the Emperor to resort to blockade. On the 9th December Osman Pacha essayed to cut his way out to Sophia; he was defeated and had to surrender. It will thus be seen that Osman Pacha, with a superior force, in the face of an enemy who had no idea of systematic attack, was favourably placed to an extent which puts the Plevna defences altogether out of the category of *improvised* field fortification; it is, however, none the less instructive, as showing the hoplessness of attacking a well organized system of field works by any other method than that of blockade or regular siege.

lishment of the 1st Artillery position consists of three operations (1) reconnaissance, (2) building, and (3) arming the batteries; it is during the last two operations that the defenders must utilize all their resources, night and day, to defeat the object of the besieger. The guns which are already mounted on the front to be attacked must strenuously oppose the building of the batteries from the outset; these guns must be strongly reinforced with the utmost celerity, and the subsequent arming of the enemy's batteries rendered as costly an operation as possible, special attention being devoted to the batteries which are likely, from their position, to cause most annoyance to the defence. Every nerve must be strained during this period to destroy the enemy's works and disable his guns *before* they are in a position to reply; a couple of hours now is worth weeks subsequently; it is, above all others, the occasion on which the material odds are in favour of the defence; every improvement which has been made in recent years in guns, gunnery, and gunpowder is at the disposal of the defence, while for a brief space the assailant is no better off than if he had nothing but bows and arrows; cover has to be erected for his guns in certain positions, and the guns have to be mounted in those positions before any effective reply can be made to the defender's artillery. Here, indeed, is an opportunity for the Q.F. guns; the maximum of work has to be accomplished in the minimum of time, and it is not only in the actual rate of firing of the guns already in position that the defence secures an initial advantage, but equally in the rapidity with which the guns can be brought up to reinforce any threatened part of the works owing to their comparative lightness.

"There is in addition another point, the importance of which can hardly be over-estimated, viz., the increasing use of the system of offensive defence; even the imperfect use made of detached forts in 1870-71 shows that an active defender will for the future use the forts chiefly as a line of keeps and observatories in a great defensive position, the forts themselves only mounting such guns as can be thoroughly well covered; while a number of these guns, as well as a proportion of the artillery from works not engaged, will be posted in siege batteries between or just in rear of the line of forts, and connected with them by trenches; in rear of these trenches fresh batteries can be made into which to shift any guns that may be too hardly pressed by the attack."¹

The arming of these batteries will be a comparatively light task if Q.F. guns of suitable calibre are available, and the advantage accruing to the defenders will be threefold.

1. The mobility of the armament, compared with what would be required in the case of slow-firing guns.²

¹ "Manual of Siege Artillery," p. 14.

² Thus a 14-pr. Maxim Q.F. gun, firing deliberately at the rate of one round in every five seconds, throws an aggregate weight of 168 lbs. in a minute; while a 40-pr. B.L. gun of the siege train in order to compete with this would have to fire at the impossible rate of four rounds a minute. The weight of the 40-pr. gun and carriage is more than double that of the 14-pr. Q.F. gun and carriage.

2. The continuity and rapidity of fire at critical moments, rendering the construction, arming, or repair of the enemy's batteries an absolute impossibility.

3. The smallness of the mark offered to the enemy's fire, and the comparative ease with which suitable protection can be afforded.

The besieger meanwhile endeavours to push forward and establish his first parallel just outside the effective musketry range of the place, the batteries of the 2nd Artillery position being established in its vicinity. These batteries will be principally howitzer batteries, for the purpose of breaching, demolition, and searching the interior of the work; the attempt to counterbatter any given face of a work having given way to the more certain method of rendering the emplacement untenable by wholesale demolition of the parapet by howitzer fire. For this purpose, as well as for breaching, considerable accuracy of fire is required, and a glance at Table A will show to what extent the accuracy of the shooting is affected by the range; the question of effective striking velocity is of no interest, inasmuch as with the 6·6-inch howitzer the s.v. is never less than 420 f.s., even with the minimum charge of 1 lb., and a s.v. of 439 f.s. at an angle of descent of 19° will lodge a proportion of shell in a concrete wall; with the 8-inch howitzer the lowest s.v. is 432 f.s. at a range of 1,500, and beyond this range, the s.v. increases. The power of accurate howitzer fire to breach earthen parapets was shown by the experiments at Dungeness, in 1882, when an earthen parapet 30 feet thick was breached by 7 rounds (6 effective) of 8-inch howitzer common shell at 1,200 yards range. On the other hand a howitzer battery (6-inch cal.) at Strasbourg failed to make a practicable breach after 467 rounds at a range of 770 yards.¹ This may have been due to the action of the fuze being too quick.

The following extract from Table A will show how the accuracy of the 8-inch howitzer is affected by the range :—

Range, yards.	Angle of descent.	Vertical margin of error for 50 per cent. of shots, in feet.
1,200	4° (11½ lbs. charge)	3·63
	12° 48' (4½ lbs. charge)	6·66
1,500	5° 12' (11½ lbs. charge)	5·52
	16° 54' (4½ lbs. charge)	10·35
2,000	7° 16' (11½ lbs. charge)	10·08
	25° (4½ lbs. charge)	20·86

This would appear to fix the position of the howitzer batteries for breaching and demolition at an average distance of a mile from the works, and beyond 2,000 yards it is clear that accurate shooting could not be expected.

With regard to howitzer batteries for searching the interior with

¹ Brialmont, "Fortification du Temps Présent," p. 201.

shrapnel, an extract from Table A gives us an idea of what may be expected from the 8-inch howitzer.

Range, yards.	Angle of descent + 5° (= semi-angle of opening for shrapnel).		Horizontal margin of error for 50 per cent. of shots, in feet.
1,200.....	9° 0' = $\frac{1}{6}$	(11½ lbs.)	49·2
	17° 48' = $\frac{1}{3}$	(4½ lbs.)	27·9
1,500.....	10° 12' = $\frac{1}{5·5}$	(11½ lbs.)	60·3
	21° 54' = $\frac{1}{2·5}$	(4½ lbs.)	34·2
2,000.....	12° 16' = $\frac{1}{1·6}$	(11½ lbs.)	78·3
	30° 0' = $\frac{1}{1·7}$	(4½ lbs.)	44·7

In order to be most effective, then, these batteries would be established, if possible, about 1,500 yards from the works to be attacked, probably just in rear of the first parallel, and it is at this point in all probability that the sieges of the future will virtually be decided. The energetic defender, with his mobile armament of Q.F. guns, aided by the electric light, will be in a position to dispute every inch of the ground; the defence will be of the most active and aggressive character, and the assailant's working parties will not be left a moment in peace; the construction and arming of the besieger's batteries will involve such a sacrifice of life, that the raising of the siege may confidently be expected. If, however, we grant success to the besieger up to this point, it still remains for him to assert the superiority of his artillery fire over that of the defence, before his trenches can be pushed forward in advance of the first parallel. In order that this may be carried out effectively, it is generally agreed that all the batteries of the 2nd Artillery position should open fire simultaneously at daybreak on the morning when the arming has been completed. General Brialmont says: "The artillery (of the 2nd position) should obtain a marked ascendancy over that of the defence, in order to render the approaches possible; the fire from this position must be more rapid than that of the first position."¹

The besieger² is, moreover, credited with the power of concentrating the fire of a superior number of guns upon the fronts attacked, owing to the greater area available for gun emplacements which he

¹ "Fortification du Temps Présent," p. 198.

² When batteries are efficiently screened, their construction and arming can be more deliberately carried out, and the necessity for opening fire simultaneously at daybreak is not of paramount importance. The besieged would, however, devote their attention at an early period to preventing the building of the screens.

can command, compared with the restricted sites which can be utilized by the defenders.

If, however, the besieged have the advantage of Q.F. guns, the tables are completely turned, for not only is the fire of the place able to hold its own from the outset, but the rapidity with which it can be delivered will more than counterbalance the numerical superiority of the besieger's pieces. We may fairly conclude under these circumstances that the assailant's advance beyond the first parallel will be tedious and painful in the extreme, that heavy losses will have to be faced in cold blood, and that his *morale* will inevitably suffer; "common trench work" will have to give way to "flying trench work" at a very early stage of the proceedings, necessitating heavy additions to the impedimenta of the siege train, and excessive exertions on the part of the working parties; the guard of the trenches will have to be considerably strengthened to resist the sorties, which, under the given circumstances, will be of a more sudden and effective nature than has hitherto been the case; and finally the approach, even by "flying trench work," will have to give way to the snail's pace of the "sap";¹ moreover the "shallow sap" will avail little when the concentric fire of a few Q.F. guns is brought to bear upon the sap head;² and the advance by "deep sap" for a few hundred yards is an undertaking which might well damp the ardour of the most persistent. Let us, however, concede the possibility of establishing the third parallel, which in an ordinary case might be pushed forward to within about "70 yards of the crest of the glacis, when there are no countermines, and about double that distance if there are."³

It is inconceivable that a successful assault could be delivered from this parallel, over ground prepared with obstacles, and swept by the deadly fire of machine-guns and magazine rifles; the further approach by sap presents immense difficulties, which, however, must be faced if the subsequent assault is to have the smallest chance of success; obstacles must be removed, and, if possible, further cover provided between the third parallel and the crest of the glacis; guns and howitzers must be brought up to short ranges to subdue the fire from the covered way, and finally, recourse must be had to mining to blow in the counterscarp, and prepare a practicable opening into the ditch for the assaulting columns.

¹ 1 yard per hour.

² Extract from Report of Lydd experiments by Colonel Baylay: "Range 300 yards; target single deep sap, double sap, blinded sap:—Even with the less powerful piece (6-pr. Hotchkiss Q.F. gun) very few rounds sufficed to effectually demolish the sap heads, and also in the case of the single sap, the 'earlier executed' portion of the work. With regard to the blinded sap, the frame capsills, being exposed as soon as the sap head was demolished, were soon cut through, leading to the fall of the overhead cover."

"Target—kneeling sap, inclined at 30° to line of fire:—the 6-pr. Hotchkiss common shell burst in the sap roller without displacing it; the fragments of shell appeared to search the head of the sap thoroughly." It was noted that ring shell proved more destructive than common shell.

³ "Fortification du Temps Présent." Brialmont, p. 201.

The next operation will be the passage of the ditch; and it is usually assumed at this juncture that the flank defence of the ditch has been so impaired by the besieger's artillery fire, that the resistance to be anticipated will be comparatively feeble. The provision for flank defence varies in different types of works; in the older traces, wide ditches flanked from the parapets were the order of the day; modern ideas have demanded a simpler trace and more frontal fire, relegating the flank defence to caponiers and counterscarp galleries; these again are likely to be extensively modified to suit future requirements, and there is little doubt that flank defence of this kind could be easily destroyed by the fire of modern howitzers. The existence of a ditch is not an unmixed blessing, but where it does exist it must be defended, and defended with considerable vigour, inasmuch as it would otherwise afford a ready made parallel or place of arms for the assailants from which to base the subsequent assault in security. Military economists chuckled enormously when they discovered that our old smooth-bore 32-pr. guns need not be thrown away, but could be used for the flank defence of ditches. These guns, after being converted into breech-loaders, are excellent weapons for firing case shot, but they are of a hybrid nature, being less effective in man-killing power than machine-guns, and of very little value indeed for the destruction of material such as sap shields, earthworks, &c. Here, indeed, is a position in which rapid and heavy fire is an absolute necessity, and the enormous advantage conferred by Q.F. guns in the flank defence of ditches can scarcely be overrated.

It must be borne in mind that though machine-guns throwing bullets are most valuable, nay indispensable, for this purpose, they are not everything, and a few Q.F. guns throwing shells are required to destroy the enemy's works in connection with the passage of the ditch: the escarp has probably to be blown in, and blinded cover erected across the ditch to protect the storming party, and this work must be opposed from the outset. Batteries for flank defence will probably be placed in caponiers of some sort in the future, but if they are armed with Q.F. guns these works can be so reduced in size and strengthened in construction that nearly all objections to their employment fall to the ground. General Brialmont (*"Fortification du Temps Présent,"* p. 144), says: "The necessity for placing the most important pieces under protection from direct, curved, or high angle fire cannot be contested: the employment of armoured batteries will restore the balance of advantage in favour of the defence." To deliberately offer a large mark to the enemy's fire by mounting a large number of the worst guns we possess in an important position such as the flanking works of a ditch, is to court defeat, and is an economy of the falsest kind: what we require is a strongly armoured battery of the smallest dimensions, mounting a very few Q.F. guns of about 4-inch calibre, and capable of doing the maximum of work in the minimum of time and space.

Let us now pursue the siege one step further, and grant that the assailant has succeeded in silencing all flank fire, and formed a prac-

licable breach in the escarp, and that the assaulting columns are being assembled close up to the counterscarp ready for the descent into the ditch. During the period of preparation for the assault, the defenders will have been busy retrenching the breach and mounting a few Q. F. and machine-guns to play upon it as soon as the assaulting columns mount the *débris* of the broken-down escarp; the work of retrenchment will of course be opposed by a concentrated fire from the assailant's guns, and this will have to be kept under by the guns of the defence; at this advanced period of the siege such an operation would be attended with extreme difficulty, and it is probably at this epoch that the defence will labour under the greatest disadvantages, which, however, will be minimized by the rapid fire of the Q. F. guns of the defenders. The critical moment does not arrive until the storming party delivers the assault, and then, indeed, the Q. F. and machine-guns of the defence should have it all their own way.

It is, however, most improbable that a cool and clear-headed commander, with an armament of Q. F. and machine-guns to supplement the howitzer and heavy armament, and a garrison well versed in siege and fortress manœuvres, could ever permit the most enterprising assailant to come to close quarters on the near side of the ditch.

In the case of an extensive system of detached works, such as some of us would like to see round London, the questions peculiar to permanent fortification (as the term is generally understood) would of course be eliminated from the above considerations. Such a system would probably consist of a double line of field works of strong profile, the front line consisting of open, the rear line of closed works; in every case the trace being as shallow as possible, and arranged for the fullest development of frontal fire: "this," says Colonel Brackenbury, "should certainly be prepared for, as we cannot have permanent fortifications. But where are the guns to come from?"¹ The present idea apparently is to entrust the defence of London to the volunteers, the armament consisting of the guns which have been superseded in the regular Service, so that in the defence of the capital we shall have a volunteer army, improvised works, and an artillery which will inevitably be inferior to that of our opponents. What this means may be gathered from the history of Sebastopol. The artillery of the Allies was superior in quality to that of the Russians, many of the Russian guns throwing shot or shell without-bursting charges. On the 5th, 6th, and 7th September the British guns fired 122,000 rounds, as against 55,000 fired by the Russians; the losses during the same period were British 839, Russians 7,561, in addition to which 89 guns were dismounted and 113 platforms destroyed.

Before concluding, I should like to say a word as to the mounting of Q. F. guns. In permanent batteries, of course, the weight of the mounting is altogether a minor consideration, and the gun can be made so absolutely non-recoiling that the laying is in no way affected. I have, however, alluded to Q. F. guns on field carriages, and in this category I would include also siege carriages; such carriages must

¹ "Field Works," p. 284.

have a certain amount of mobility, and inventors will have to tax their brains to combine absolute stability while firing with a sufficient degree of mobility for transport according to the requirements of the case for each nature of gun. I am not alluding to this subject with a view to raising a discussion on the rival merits of carriages put forward by different makers, but with the object of correcting an impression which may possibly have resulted from the trials of the 6-pr. Nordenfelt Q.F. gun on non-recoiling carriage at Shoeburyness. Many of us will remember the interesting lecture which Mr. Nordenfelt gave in this theatre nearly a year ago on this gun;² the natural impression which most of us carried away being that the gun could be fired at a fixed object without relaying after each round. This possibly was the design, but it appears that the disturbance to the laying is sufficient to necessitate relaying after each shot. I believe, however, that this difficulty is likely to be reduced to a minimum. Passing over this point for the present, we must remember that the fact of having to relay the gun by no means condemns the non-recoiling carriage; it has other and far more important advantages, not the least of these being the power of traversing rapidly without moving the trail, and the saving of labour entailed in "running up" after every round, together with the consequent lessening of exposure both for gun and detachment. I think anyone who has seen 20-prs. or 40-prs. in action will agree with me in saying that the labour of running the guns up after every round is so excessive that it would be impossible to maintain the maximum rate of firing for more than a quarter of an hour. The well-known case of Major Mercer's battery at Waterloo gives point to this argument; after being hotly engaged for some time, and suffering heavily from the enemy's fire, the weakened detachments became so exhausted with the continual "running up" that at last all attempts to keep the guns to their original line was abandoned, the carriages were not run up any more, and they gradually converged to a point in rear until their trails were almost locked together.

There is another most important point in connection with non-recoiling carriages, and that is, the latitude which they afford to a commander in selecting a position: frequently the most favourable position for a battery would entail half the guns being brought into action with their trails downhill; to fire a 12-pr. field gun in such a position simply means that it would bound to the bottom of the slope like a football the moment it was discharged. Again, coming into action in a position where the carriage cannot run back owing to the sticky or swampy nature of the ground, is certain to be attended with injury to the wheels. I remember a 13-pr. battery, with which I was serving last summer at Okehampton, coming into action in such a position; after the second round one of the carriages was disabled owing to the fracture of the tire, one spoke and a fellow, on the lowest wheel (the carriage was on a slope of about 7°).

In the defence of fortified positions we have moreover another

² See Journal, No. 143, vol. xxxii.

important consideration to think of, and that is the advantage which a Q.F. gun on non-recoiling carriage offers in restricted positions where a run back is inadmissible.

I have as far as possible avoided technical considerations, wishing to lay before you to the best of my ability the broad issues at stake, and in no way to confuse the discussion by arguments as to the rival merits of this or that system of Q.F. gun or non-recoiling carriage.

My main contention is that the task of defending our harbours, dockyards, and coaling stations is essentially a military question; that of attacking similar positions belonging to an enemy, and protecting our commerce, a naval question; while in both cases a certain amount of co-operation from the sister Service is necessary to bring about decisive results; that we need not anticipate much difficulty in dealing with an assailant's ships provided we organize our defensive measures liberally and intelligently; and, finally, that the most profitable way of laying out our money in the immediate future is not in any further elaboration of permanent fortification, or in a continuation of the endless struggle for precedence between guns and armour, but rather in the development of frontal fire, the provision of sites for field fortifications in suitable localities, and a sufficient armament of Q.F. guns for defensive purposes, from the proposed intrenched camp round London to the iron and concrete fronts of our great military ports and naval arsenals.

Let us, above all things, never lose sight of the most salient feature in every scheme of defence, viz., that armaments are useless without men, and men of little use without training.

LORD WOLSELEY: Looking around this theatre I see a considerable number of those whom I know have recently made a special study of the subject which has been put before you in such an interesting manner this afternoon. I hope, therefore, that several will do us the favour of conveying to us their views upon this subject, that they will not allow their native shyness to overcome them,—that shyness which is so common to all Englishmen, but especially to the Officers of Her Majesty's Army and Navy.

General Sir GERALD GRAHAM, U.C.: My Lord, I have very little to add to what I think we all agree is a most able and thoughtful lecture. I have heard it with great pleasure, and I can cordially endorse most of the remarks made by the lecturer. I am strongly of opinion that our coaling stations, our dockyards, require fortification at the present time. Unless the science of war has gone backwards it is absolutely necessary to secure the bases of operations, and, as I understand it, the coaling stations and dockyards are the bases of operation for our Fleet. They are the sources of supply, and by fortifying them we leave the Fleet at liberty to undertake offensive operations. That is the principle enunciated by the lecturer, and in that I cordially agree. With regard to the quick-firing gun, I feel convinced that that is the gun of the future; that the objection which at present exists against them, it will be found, on further experience, can be obviated, and for the defence I do not think there is anything better. The principal objections, as have been stated, are the amount of smoke that is involved in quick-firing guns with the present Service powder. That is a great objection, but we hope soon to have smokeless powder, and we may expect that difficulty to be done away with. Then the supply of ammunition is no doubt a very great difficulty for guns in the field, but in a fortress that difficulty is got rid of. The lecturer has given some excellent illustrations of the immense advantage of intensity of fire, as, for instance, in the attack of a torpedo-boat; and all who have seen or heard anything of siege opera-

tions know that the besiegers take care to expose themselves for as short a time as possible; therefore it is of the utmost importance to the defence that the fire for that short time should be of the most intense character. It may be only for a short period that he has the opportunity of firing, as in the narrow passage of a ditch or the rush from the parallel to the assault, and those moments are of inestimable value to him. I think the lecturer has slightly understated the power of quick-firing guns. At present their power is hardly developed. The makers of quick-firing guns have been somewhat held in check by this difficulty of the supply of ammunition, but in the case of the 1½-inch or 3-pr. Maxim the lecturer stated that twenty rounds was about half the normal power of fire. He might have stated it was only one-fifteenth. These guns can fire 300 rounds a minute. Last Saturday they were firing at that rate—fifty rounds in ten seconds.¹ It is probable it will never be wanted to fire more than ten seconds, if you consider that ten seconds may decide a battle.

Captain STONE: What size gun?

Sir GERALD GRAHAM: That was a 1-pr., but I believe Mr. Maxim has got some automatic guns of a larger calibre, which have not yet been fully tried, with which he undertakes to fire 200 rounds a minute. Of course those are still only experimental, but the enormous power of quick-firing guns has not yet been fully developed. I am convinced that they are the guns of the future, and that in defensive operations they will be found of the very highest importance. I think these points have been clearly put forward by the lecturer, as well as the advantages of mobility and of economy.

LORD CHARLES BERESFORD: Lord Wolseley, as you call upon me, my Lord, I am bound to obey, but I am rather sorry, as this is a military lecture, that some of my brother Officers of the Army did not take up the subject first. I must congratulate the gallant Captain who read this lecture most heartily on his paper, because I think it is what I may call a blow in the right direction—in the direction of calling the attention of the public by all the means we can to this question of Imperial Defence. The public are just beginning to be exercised in their minds—not so much as we hope they will be—but they are beginning to be exercised a little on a subject which has exercised the minds of military and naval men for the last eight or ten years, and in paying a compliment, if you will allow me, to the lecturer, I must say how very unprejudiced all his remarks have been, and the remarks of all the military men lately have been of the same character, and all distinguished military men have recognized fairly and fully that the first great question of the defence of this country is the Navy, and they have brought that subject forward first in all their arguments. Whenever the question of invasion has been spoken of by military men—the question of defending the ports with quick-firing and other guns—the arguments have always been based on the assumption that we had lost the command of the sea through having too small a Fleet. I am perfectly certain that I represent the feelings of my brother Officers in saying that we all recognize the thoroughly patriotic spirit in which military men have taken up this question by taking the naval question first, because, remember, the military men have some seventy Members of Parliament, the Navy only five. They are represented at Court, and in the clubs, and society, whereas we naval men are hardly represented at all in the places which hold power and

¹ I had just received this information on a slip of paper from Mr. Nordenfelt, who was present at the experiments referred to, but I made a mistake in supposing him to allude to the 3-pr. The 1-pr. or 37-mm. automatic Maxim will probably be adopted by the French. It has a velocity of 1,320 ft., and can fire 250-300 rounds of shell per minute (on one occasion nearly 400 rounds were fired). The Maxim 3-pr. (semi-automatic) referred to by the lecturer is a 47-mm. (1'85 in.) gun, firing common shell and shrapnel of 3½ lbs. weight. It has a velocity of 2,000 ft., and when tried at Paris sixty rounds were fired in a minute, with good results, as Mr. Nordenfelt informs me. I think, therefore, I was justified in observing that the lecturer had somewhat understated the power of existing quick-firing guns.—G. G.

interest, and we look to the military men to help us in this great question of Imperial Defence. There are a few remarks I should like to make about the paper. I agree almost entirely with everything that Captain Stone has said, except in one or two particulars. I quite agree with what fell from the gallant General, Sir G. Graham, that the first thing we have to think of is to keep up our lines of communication. That is the first thing a soldier or sailor thinks of when at war,—that means, so far as our country goes, the line of communication for our food and raw material. The Fleet has to do that. But, in my humble opinion, the General is perfectly right in saying that the ends of that line of communication should be strongly fortified, that is, the arsenals, the great dockyards, and coaling stations. There is one exception I would take on the question of coaling stations. I have always held that the coaling stations ought to be defended by Marines. I admit it is a great question of argument, but my reason is this: I think in war the coaling stations will come more or less under the command of the Admiral on that station. It is possible there might be a little friction between the Admiral and the General at the coaling station, and that is what we want to avoid. The other reason is that I think it would be far cheaper. Your basis of supply is Imperial, and it must be cheaper to have your basis of supply for the station in the Fleet than it is by the present system. The lecturer called attention to the large amount of shipping—700,000. Three-fourths of those are ships which would come more or less under the denomination of coasting vessels. The real number of ships—steamers—that we have above 100 tons, to keep up our food supply and the supply of raw material by which the workmen get wages, is 5,718, and the French only have 481. And yet I may be allowed to repeat what I have said before that if the French were to lose the whole of their Navy and mercantile marine they would still remain a first-class Power, because they could feed their people; whereas if we lose two battle ships our food supply might be stopped, and our raw material. I am diverging from the subject a little, but it is to try to bring whatever influence I can to bear on this question of the coast defence, supported by the quick-firing guns that the lecturer has brought before us to-day. The lecturer says that the rôle of the Navy should be purely offensive. I entirely agree, but he has put down here a definite idea, and it is this want of a definite idea that we suffer from in both Services. We ought to put down, as he has done, what we have to defend and how we are going to defend it, and until we do that I am afraid we shall never get anything really satisfactory for the defence of the Empire. The lecturer said that not a single Egyptian gun was disabled at Meks. I do not think he is quite correct in that. No doubt the fort was an old-fashioned one, but it is the best fort in the world for defence, because it is so difficult to hit. It is such a small target. A barbette fort is the most difficult fort to hurt, because to hurt it you must put its guns out of action, and where you have only a gun pointing over the top of the fort you have to put your shot into the muzzle of that gun to put it out of action. If he is firing at you all the time it rather disconcerts your aim, and your shot will either hit the parapet or go right over the top. The difficulty of taking a fort of that description by assault, if it had quick-firing guns, to my mind is perfectly clear; I should say it is almost impossible, if it is armed in the way the lecturer advocates. I also agree entirely with the lecturer in the question of a number of small projectiles being a great deal better than one large one, and for my own part—of course I may be corrected by my military brother Officers, who know more about it than I do—but if I had to work a battery on shore I would rather have two batteries of twelve 3-prs. than one battery of six 6-prs., because I think the moral effect would be very much better and you would more quickly gain your object in view. I know our noble Chairman has very strong views on the question of smokeless and noiseless powder, and for my own part I can say I believe that when we do get the noiseless and smokeless powder, if we get the machine-gun and quick-firing gun generally, not only for defence but for offence, I believe it will revolutionize warfare altogether on the land. I would congratulate the gallant lecturer on a very strong sentence in which he says he hopes we shall divest ourselves of all party feeling and prejudice on this question of defence. I did my best to say what my thoughts, and I think the thoughts of my brother Officers, are with reference to the line the soldiers have taken in this question, and I am very glad he put that in

the paper, because it shows the line I believe everybody in this room and outside intend to take on the matter. I must differ, however, with the gallant lecturer on the suggestion that he puts here, that the "sailor loves his ship." He ought to, because he lives by it; but he says he thinks he puts his guns in the second place. Well, he did, we are quite agreed, but nowadays he puts the guns in the first place, because what he did with his canvas before, he now has to do with his engines. What we want is the man who can put his ship in the best position to fire the guns, but when it is in that position you want the very best gunners you have got to settle your enemies with despatch. The great argument the lecturer brought forward, in my opinion, on the question of quick-firing guns, is contained in the clause in which he says that it is a gun that will do the maximum of work in the minimum of time, and that is exactly what the quick-firing gun does do. There is one more remark I should like to make. Just at the bottom of page 10 the lecturer says, "But where are the guns to come from?" Well, that is a question that I think exercises a great many minds at this moment, and, in my humble opinion, till we get hold of this question of the gun supply, and until we get rid of all this political nonsense that we hear talked about this question of the guns, this deficit will exist. This country can produce the guns. We ought to employ more firms and to give them time to make the guns. A firm gets an order for a certain amount of guns, and it has to do it in a certain time. Therefore, out of twelve months in the year probably it only works five, and they have to turn off the workmen for the time or to work for foreign Governments. The orders are given late in the financial year, and have to be finished by the end of the financial year. It is not done in a business-like way, and I think I shall have the approval of the Officers of both Services if I do my best in the House of Commons to wake the country up on this question of the guns. Even if we have the best ships, the best men, the finest brigades, and the best Generals, they are perfectly useless unless you can put something into their hands and enable them to fight. The lecturer's concluding remarks I most entirely agree with, when he says that "armaments are useless without men, and men of little use without training." As to the question of training, another question ought to enter into our calculations, more particularly with regard to the coast defence, for which this quick-firing gun will be probably more applicable. My own humble opinion is that it is entirely auxiliary, or should be. First get your Fleet in order, then your ports and arsenals fortified, if possible, at the same time; but, every pound you spend on your Fleet or ports and arsenals is worth 3,000*l.* spent on the question of coast defence for certain localities, even for the object which they wish to gain, because it is no use defending certain localities which may never be hit at all, and would never be hit if your Fleet were big enough to adopt a definite plan of campaign, which is to watch, and, if possible, destroy every one of the ships of the enemy.

Colonel W. W. KNOLLYS: The lecturer spoke of the patriotic feeling of the Army in saying that they, both in public and in the newspapers, would urge above all things attention to the Fleet. There is no doubt the Fleet is the most important—far more important than the Army. At the same time I am glad to find that he struck a blow at a certain heresy which makes us talk of the Navy as if it were not only our first line of defence, which it is, but as if it were our only line of defence—as if the Army were to be completely neglected. I think Captain Stone helped to disperse that error. With regard to his remark that it would be impolitic and foolish to keep our Fleet hugging our shore: it seems to me that it would be a terrible waste of mobility to do so. Having said that, I have only a few more remarks to make on Captain Stone's paper. In speaking of the quick-firing guns he omitted to mention one point, which is that on account of their great mobility they will largely facilitate siege operations. Everybody who has studied the history of sieges knows how much the work consists in dragging the guns from the roads over rough and soft ground, and sometimes through trenches, to the batteries; that operation will be greatly facilitated by having these comparatively light guns. I should like to ask the Engineers their opinion, in the face of the extreme ranges of these new magazine guns of ours. I saw them firing at Aldershot at 2,800 yards. With respect to the first parallel: now the first parallel is spoken of as about a mile distant from the place, and it seems to me that the new magazine rifle in the hands of trained men

would make it very unpleasant both to those who are building the battery and also for those who are working the battery when constructed. Another remark was made by Captain Stone with reference to counterscarp galleries. I would ask, does he not think it somewhat obsolete? I can hardly believe in these days you can expect any men to fight with much determination in a counterscarp gallery where, unless you have got an elaborate system of underground communication, they will be cut off and killed or captured. Then he referred to improvised works round London, and very justly cast discredit upon any idea of defending London by such means. Is it necessary that these works should be improvised? Should we not have a plan carefully worked out, fixing boundaries, sunken stones to mark the angles of works, and in every district having drawn up on paper, profiles, number of men, provision for tools, and details of men who are to work, to construct, and also to man these field works? Should that not be done? It cannot be too much impressed upon the public that the best men to construct field works are the men who have to defend them. I cannot but think so, and I dare say it is so—very properly we are kept in the dark about that—but if all the arrangements, all the tracings and estimates of works, positions, minute details of these field works for the protection of London have not yet been worked out, I cannot but think that it is absolutely necessary to work them out.

Mr. NORDENFELT: My Lord, the lecturer will allow me to say a word to remove a possible misapprehension that might arise from a statement with regard to what I may call "officialism," though I am sure he did not mean it, nor that any of us would misunderstand him. What he complained of as to the possible want of interest in modern inventions and in driving forward improvements, did exist a good many years ago, but the last few years, under the *ægis* of the illustrious President of this Society, there has been a very distinct change in that matter. Of course it may be said that the majority is very likely against my view. If ten men produce guns for the same object, nine of them are the majority who are very apt to say hard words of the Committee that decides, or to the one man who has happened to get in. When I have been out in the cold I have sometimes felt sore about it. But I am sure that we must all fully admit that Officers in this country who attend to these questions have nothing else at heart but the full and fair advancement of the interests of the country. In one thing I join issue with the lecturer. He mentioned the words "complicated machinery" with reference to quick-firing guns. There has been an idea that quick-firing guns are complicated, but I beg absolutely to deny this. A quick-firing gun, be it a 3-, 6-, or 14-pr., is distinctly and absolutely more simple in mechanism than the ordinary breech-loading gun. I am prepared to prove it by putting the mechanisms on the table and comparing them piece by piece, and I shall prove that our quick-firing guns are very much simpler than the ordinary field-guns. Captain Stone mentions that from Shoeburyness experiments they have found out that quick-firing 6-pr. guns do not stand sufficiently still to fire without adjusting the aim. That is quite true, but I never said they would always do so. There are a great many uses for quick-firing guns, and when quick-firing guns are mounted in disappearing turrets, in caponiers, or on siege gun carriages, which need not move very quickly, they can be fired in series with little or no adjustment. But when they are mounted on field carriages specially made light for the purpose of being easily run back from outlying forts, then the carriage does move slightly, or the vibration of the weapon makes it necessary to readjust the aim, and I found the clever gunners at Shoeburyness fire almost as quickly when they relaid as we did when we did not relay. I do not mean to say that gunners in the field have as great training as the Shoeburyness gunners have, but the gain of being able to move the gun for certain purposes is certainly greater than the advantage of being able to fire repeated shots without relaying. Experiments were made last year at Okehampton with shrapnel with percussion fuzes, and it would be exceedingly useful for all concerned if some day the results were made known. I am delighted that a "real live gunner" has taken up the question before us and has given such an excellent lecture. Not many years ago, when I came to Artillery Officers, they said, "You are a very nice fellow, but we don't want you." Nowadays we hear from every quarter the cry of "Guns! guns! quick-firing guns! small guns!" and, therefore, naturally, besides the great pleasure I personally have in hearing it, I am quite sure it is

useful. I would like to add a word to what Lord Charles Beresford said just now about getting guns made. There is not the slightest difficulty in getting guns. If the Government would dare to face the Chancellor of the Exchequer for the time being, and put before him a scheme by which you could utilize your tools and men and labour as they exist—if, instead of every gun having to be delivered by the 31st March, in order that Mr. Conybeare and other gentlemen may exercise the right of, as they call it, "controlling the expenditure"; if, instead of doing so an order were spread over a couple of years, there is not the slightest difficulty in getting guns. But what happens is that this Parliamentary control prevents not only the tools of this country but the men from doing any work for on an average five or six months out of twelve. As to the question of twelve 3-prs. against six 6-prs., I do not go quite so far as Lord Charles Beresford, but I would like twelve quick-firing 3-prs. against six ordinary breech-loading field-guns, and I quite agree with smaller shell; in many instances you can fire more quickly with more effect, but the 3-pr. and 6-pr. of the same class of gun are both very handy weapons. Of course when you come to larger weights there is a greater difference. Sir Andrew Clarke, the late Inspector-General of Fortifications, told me once, "Quick-firing guns will come in some day, only we cannot get the money for them now," and he very strongly backed up my idea that these guns should not be placed in batteries or anywhere near the big guns, but hundreds of yards right and left, or up the hillsides, so that the enemy would not take the trouble to find the range for them, and that they would not be hit by badly-aimed shots aimed at the larger fortifications. In those positions they would be very useful, and would make it very difficult for the crews of the enemy's ships to handle their guns. For land forts there are three distinct objects for the use of quick-firing guns. For the defence of ditches (caponiers), for disappearing turrets, and for ramparts, there must be guns that can be run about to any part of the fort that might be suddenly attacked. Taking the averages of all these things, I believe the 6-pr. is the most useful. They fire very quickly. If you put up a battery of six 6-pr. guns they will fire in *one minute* either 25,000 lead bullets out of shrapnel for long range fire, or 60,000 lead bullets out of case shot for short ranges. Six guns will fire in one minute 60,000 bullets. Unless these figures are really understood, one does not quite see the real value of quick-firing guns. The accuracy in the same way is very much greater than appears at first sight. I do not want to praise our guns, but I want to draw attention to the fact of their firing accuracy. We fired at Vienna at 1,100 yards with 6-pr. shrapnel; and in 21 seconds hit 159 men out of 180 marked on three targets. At 2,200 yards we hit 123 men out of 180 in one minute from one gun and one man firing. I think that gives clearly the idea that the maximum work in the minimum time must under certain given circumstances be not only desirable but absolutely necessary, and the sooner that point is faced the better. Not only must the country provide quick-firing guns for actual requirements, but the country must be made to realize the enormous risks we run in case of a serious reverse in war if the War Office has not large numbers of guns in reserve fully ready to replace those lost in battle; it must be made quite clear to the House of Commons that modern wars will be so short, that it will be absolutely impossible to make many new guns while the war continues. Where are our reserve guns at this moment?

Lord WOLSELEY: Before I ask the next gentleman to speak I should like Mr. Nordenfelt to give us a little information on a point of very serious importance. We have heard a great deal about the effects and accuracy of field-guns, but no one has told us what quick-firing guns are actually in existence. I believe there are a number of 6-prs. I have heard of 9- and 14-prs., but I should like to hear from Mr. Nordenfelt, who is such a great authority on this subject, how many quick-firing guns he has made for our Government, and what is the character of those guns which have passed beyond the experimental stage. I do not refer to experimental guns, but to guns actually ready for use that have been already supplied for the public service.

Mr. NORDENFELT: Guns actually ready for use and beyond experimental stage, of larger types than rifle calibre machine guns are the following: 1-inch machine guns; 1½-inch (1-pr.) automatic guns; 3-pr. ordinary quick-firing guns, Hotchkiss' and my own, or the automatic hand-loading Maxim gun, which fire ordinary shell,

ring shell, or shrapnel. There are 6-prs. for several different purposes, for sea ports and land forts, firing shrapnel, ordinary shell, and case shot, and the Nordenfelt 3-inch 14-pr. high velocity gun. Then there is the Armstrong gun, the shell weight of which seems not to have been definitely fixed, between 36-, 40-, and 45-pr.

Lord WOLSELEY: Are these experimental guns?

Mr. NORDENFELT: They are, I believe, experimental so far as weight of shell is concerned, but they have been fired on board the "Excellent," and they have been fired at sea. I understand practically they have been adopted by the Navy. There is also the 8-pr. Nordenfelt gun for field use; they are not specially for fixed fortifications but rather for horse artillery guns to follow cavalry. The 14-pr. Nordenfelt has been adopted by the Colonies and abroad, and the Government has bought one 8-pr. from me, which I believe is going to be fired next month; it is in full preparation for field use, carriage, limber, and everything complete, and that is all. There are as yet no bigger guns which can be said to be ready, though we are making 5-inch and 6-inch quick-firing and automatic guns.

Captain WILLOUGHBY VERNER, Rifle Brigade: Lord Charles Beresford referred to the waste of money which it would be, were we to go in for stationary coast batteries before we had properly armed our fortresses and coaling places. It seems to me that that is a very true remark, but it raises the question that in these quick-firing guns we have a gun whose mobility and whose easy capabilities of being worked in a limited space make it peculiarly adapted for a mobile system of coast defence, either in the vicinity of our fortresses, or to oppose a landing on our coast. Captain Stone has told us how the 3-pr. quick-firing gun has a penetration of 4 inches into wrought-iron, and I understand that Mr. Maxim's new semi-automatic 14-pr. quick-firing gun has a penetration of no less than 8 inches. It appears to me that, with such a penetration, any vessel which was not sufficiently armoured to withstand these projectiles would have a very bad time of it if she attempted an attack of the Paul Jones type in our next maritime war at any part of the coast in the vicinity of which such guns happened to be stationed. Not only are these guns, by reason of their exceptional powers of penetration, well adapted for coast defence purposes, but owing to the practical absence of recoil they could be used in situations where ordinary field or siege guns could not be served. Take, for example, the stretch of coast on our southern shores for a good many miles where there is a sea-wall protecting the low-lying ground from the irruption of high tides. Along this section of the coast, except at a very few points, it would be impossible to bring field-guns into action, since this sea-wall is too high to fire from behind, and is not wide enough on the top to permit of working guns, not to speak of the exposure of the guns. Now, at very slight trouble, field emplacements for working quick-firing guns along this stretch of coast could be readily made at various points, especially at places where existing ramps conduct from the high road in rear of the wall to its top. I believe I am correct in stating that there is no more difficulty in moving a quick-firing gun on a travelling carriage than an ordinary siege gun, say a 25-pr., and assuming that they can be moved at a minimum rate of even three miles an hour along a road, it is obvious that they could be brought to the required point and be used with effect anywhere along the section of coast I have indicated. Should a landing ever be attempted on our southern shores there is always this chance, that it may be carried out by beaching the mercantile steamers conveying troops, and thus obviating all the risks and delays of a boat landing. Vessels so engaged would be certain to be armed with quick-firing guns, and hence they must naturally be met by similar weapons. That this operation of beaching vessels is a perfectly practicable one is, I think, well known to many naval men. A considerable number of large vessels have at different times run ashore on the part of the coast I have alluded to. In some cases they have beached themselves bow on, and run up the "full," so as to be left high and dry by the receding tide, and in almost every instance they have been got off undamaged. In one case, some years since, a sailor graphically described it to me by saying that he stepped over the bow into a grass field. I believe quick-firing guns in such an emergency as a landing of this type would be most valuable, as they could either smash in the bows of an advancing vessel and sink her, or, reserving their fire until she took the ground, annihilate the troops who attempted to leave her. I

have recently ventured to advocate the armament of our Volunteers with Maxim machine-guns for coast defence, and I would like to go further and suggest that a proportion of quick-firing guns should also be placed at their disposal. The objections made to the difficulties of transporting sufficient ammunition for these guns would hold with less force in such a case as coast defence than in any other, for depôts of ammunition might be collected at certain places along the coast, and the numerous good roads which exist almost everywhere in England would render the transport of ammunition to the required spot no very great difficulty. It has been argued, also, that it is not advisable to place such elaborate machines as quick-firing guns in the hands of our Volunteers, but I think that those who say so overlook the fact that for troops who have not the advantage of continuous training what is required above all things is simplicity of service. Simplicity of construction is an excellent thing no doubt, but if the mechanism of an automatic or semi-automatic gun be so constructed as to be capable of standing extended experiments in a satisfactory manner it ought to be good enough to put in the hands of our Volunteers without much apprehension. Many of us use hammerless guns for shooting game on account of the extreme rapidity and simplicity of service. To be logical, if we object to quick-firing guns we should discard our hammerless guns and revert to muzzle-loaders and shot flasks. One thing is certain, there can be no comparison between the simplicity of serving a quick-firing gun and the process of working an ordinary artillery piece. Although I have mentioned Volunteers, I of course do not wish to be understood to advocate that they alone should be supplied with these guns, which latter, in my humble opinion, should form a part of the defensive system of our fortresses, fortified places, and last, not least, of our coasts.

Lieut.-Colonel L. K. SCOTT, R.E.: I did not come here, my Lord, to speak. I agree, however, with everything that the lecturer has said with reference to the important advantages of quick-firing guns under certain conditions, and therefore I cannot add much to it except to say this: Captain Stone referred to the Watkin position-finder being employed in connection with quick-firing guns, and I understood him to say that these quick-firing guns should be placed in position out of view of the enemy, and behind cover in such a manner that they would be entirely dependent on the observer at the Watkin position-finder for their laying. Now, I myself do not think that guns are placed in an effective position for coast defence, unless the water to be protected by them can at the same time be seen from their own sights, because although the Watkin position-finder is no doubt a very admirable and clever invention, and a very good thing indeed for the purpose of firing guns in groups, yet fogs or smoke might at any time obstruct the view of the observer in the conning tower, and at the same time not interfere with the view from all of the guns themselves; therefore if the guns can only be fired in groups by the Watkin position-finder and they are so placed as to be deprived of independent action and of the use of their own sights, it stands to reason that we should on occasions lose the defensive power of our battery.

Major F. BARKER, R.A.: The lecturer made one or two observations that I think are somewhat discouraging to the Services, and might possibly be rather misleading. He mentioned the accuracy which the gun was capable of arriving at, but he stated that the powder used in the Service was bad.¹ Well, as the gunpowder is the propelling agent on which the guns are dependent for their power, if it be bad I fear that our country is not in a very satisfactory condition as regards its defences. I submit that, although the lecturer made this remark, and though possibly it may be found that there is a good deal to be said against the Service gunpowder, yet it can hardly be called bad. First and foremost I would invite the attention of members to that admirably compiled diagram which we have before us. The results therein quoted are fairly satisfactory, and the accuracy obtained cannot be complained of. But it is totally dependent on that small word that we see above, "charge," that being "Service" powder, the propelling agent which drives the projectile to the

¹ It has been shown in the reply that this referred to the amount of smoke, and not to the quality of the powder.—ED.

range required. There is just this to be said. There is a grave objection to the powder as at present used, and that is the smoke that it produces. That subject is being carefully considered and gone into, and to get rid of it is the object of those who are employed in making gunpowder. One thing that I submit to those present is that the gunpowder at present employed gives accurate results, which compare favourably with those which could be obtained if steam or any other propelling agent were employed, that is to say, you get a projectile to go at the rate of about 1,250 miles an hour, with a mean deviation or inaccuracy of velocity of about 10 feet a second.¹ Those results are necessary before the powder is accepted into the Service, and I think they can hardly be called bad in the propelling agent which is now employed. The lecturer was also good enough to mention a very enterprising firm for which we all have the greatest respect, the Chilworth Company, and the powder which they are manufacturing at present. We know its composition; it has advantages, and we know that there is a certain less amount of smoke produced by it than what is commonly called the new Service powder, but it has one grave objection which all of us who serve ought to keep before us. You store what is called the Service powder. It is made to withstand climate, ordinary moisture, heat or cold, and also to be submitted to extremes of temperature without much injury. We have all of us, who are engaged in investigating and making gunpowder, seen the Chilworth powder. After that powder has been exposed to the atmosphere for a very short time it will become of the constituency of mud, and absolutely unserviceable for the usual requirements of gunpowder; it will not project a shot, it will not make any projectile leave the muzzle, and from mere exposure to extremes of temperature and climatic moisture it becomes absolutely unserviceable. We must remember this before we adopt any proposal, however it may be recommended by those who are promoting it. For that reason I just wish to submit to you, my

¹ The new (or modern) gunpowder must fulfil the following conditions at proof (three rounds being fired from each lot) before acceptance into the Service:—

Nature of powder, charge, &c.	Muzzle velocity to be imparted to projectile.	Mean deviation not to exceed	Pressure to be under
Prism ¹ E.X.E., 48 lb. charge, 100 lb. projectile.....	1,960 to 2,000	10 ft. velocity	tons. 17·5
Prism ¹ S.B.C. (slow-burning cocoa), 360 lb. charge, 655 lb. projectile.....	2,010 „ 2,050	„	16·5

And the following results of firing recently manufactured Service powders show how fully these conditions are fulfilled, and what uniform and reliable propelling agents they are:—

Nature of powder, charge, &c.	Muzzle velocity.	Deviation from mean.	Pressure in tons per sq. in.
E.X.E., Lot 74, fired Nov. 16, 1888, charge 48 lb., shot 100 lb.	1,977	0	16·5
	1,983	6	16·3
	1,970	7	16·7
S.B.C., Lot 80, fired Dec. 28, 1888, charge 360 lb., shot 655 lb.	2,030	1	16·5
	2,028	1	16·3
	2,028	1	16·7

Lord, and to those present, the desirability of considering these new claims for gun-powder before rashly adopting them, to the possible detriment of our forces when engaged in action either here or in foreign lands.

Colonel J. P. RICHARDSON: The lecturer has selected Plymouth as one of his instances of a naval attack. Now I happen to be answerable for the artillery defence of that fortress, and, though I agree entirely with him in the desirability of quick-firing guns, I do not think we ought altogether to exalt them at the expense of everything that has been of very good service to us so far. I doubt altogether whether we are so utterly defenceless there as is represented. Although we have no quick-firing guns, and long for them very much indeed, still I believe the place is capable of defence against anything but a very prolonged and determined attack. I also think that the lecturer has not quite hit on all the good quick-firing guns would do for us, taking Plymouth as an instance. He has named the position-finder, and given a fairly accurate description of its use there, but the quick-firer might help us in another way. The last speaker referred to the excellence of the Service powder. The powder may be very good indeed (that diagram shows very even results), but powder kept different times in magazines will send projectiles varying lengths, and the lecturer is wrong when he says that with the position-finder you will "hit without fail." If the powder always threw projectiles to the same place each round, possibly it might enable us to hit without fail, but why we cannot hit without fail with the position-finder, is want of practice. It is out of reason that the country should stand our firing big guns continually to obtain the amount of practice required, but I believe the quick-firer can give us the very thing we want in that way. The quick-firer could be placed inside the bores (I have no doubt that Mr. Nordenfelt would supply us with the means of doing it) of the big guns and used to fire projectiles for the position-finder to range itself by. I take exception altogether to cracking up one gun at the expense of others equally useful. Now the lecturer, for the purposes of comparison, has produced very old facts in dealing with the 8-inch howitzer, old tables and old results, and has compared them with the quick-firer, which is so new that you, my Lord, hardly knew in what form it existed in the Service. That I think is hardly fair. He went back a great many years. Last year and the year before we deduced the rule that from 2,400 to 3,000 yards we could breach an earthen parapet at the rate of about one round to one foot of parapet, counting misses and everything; yet the lecturer talked about getting up to 1,200 yards and 1,700 yards as being necessary for effect. With improvements tried last year in the direction of allowing the howitzer to recoil in the direction of its axis, we shall probably be able to do the same amount of work at from 4,000 to 4,500 yards, which will altogether take us out of the range of musketry fire, though not out of that of the quick-firing gun. It will be very difficult for the quick-firing gun to strike people almost like moles in the earth, which men working the howitzers are. The quick-firing gun has all the defects in firing at people behind earth that high velocity guns have. When firing at gun emplacements it has absolutely no effect on people at all protected by earthen cover, whereas howitzer fire has. If we could get a quick-firing howitzer that would drop with a very low charge its shell into trenches, we should have a most valuable weapon for defence. For the attack the big howitzer will still hold its own. That is proved, because if we employ small howitzers for the destruction of earth-works and matériel we do not get anything like the result that we get out of the big ones, weight for weight of ammunition. The lecturer spoke of penetrating iron with quick-firing guns, but he did not tell us, in the instances he gives, at what distance from the muzzle the penetrations are obtained. I think rather close. For flank defences I believe the quick-firer may be most excellent. It will be invaluable for the defence of mine-fields, but I do not think it will advance its cause to claim for it what it really cannot do.

Captain P. H. SALUSBURY: I will confine myself to a very few remarks, although the lecturer and other gentlemen who have spoken on this subject have afforded us a field for much consideration hereafter, and for much comment and remark—more than can be contained within the ten minutes permitted—which comment and remark may perhaps be devoted to it by those who, like myself, often dabble in pen and ink. That may be done hereafter, also. But there are one or two points I

should like to address this meeting upon. I think, perhaps, the very title of the lecture has been somewhat misleading. The lecturer has called his lecture an Essay upon Quick-firing Guns, and has at once barred the quickest firing of all guns from discussion, inasmuch as he deals with shell-firing guns rather than bullet; otherwise, I believe we might have heard something interesting about such a machine-gun as our old friend the Gatling, in which I have a sentimental interest.

Lord WOLSELEY: If I might say so, I am sure the spirit of the meeting is that we do not wish to enter into the subject of machine-guns at all, but to confine ourselves entirely to the definition given of quick-firing guns by the lecturer.

Captain SALISBURY: Then I would simply urge that no gun should be chosen unless it has been subjected previously to trial with whatever rival may have started up in order to oppose and, if possible, gain the victory over it. The money that has been wasted in this country has been over guns that have been ordered without trial. I hope, therefore, the noble Lord who sits opposite (Lord Charles Beresford) will take care from his place in the House of Commons that neither this nor that quick-firing gun shall be adopted without competitive trials first of all.

Colonel HARRINGTON STUART: I shall only make one or two remarks, entirely of a practical nature. I have listened with deep attention and interest to this lecture, as one of those coming from a locality very deeply interested in coast defence, where I have the honour of commanding a battalion of Volunteers. I should not have risen had it not been for a remark which fell from Captain Verner of the Rifle Brigade, in whose regiment I had formerly the pleasure of serving, with regard to the serving out of quick-firing guns to Volunteers. I think there need be no hesitation in serving out these guns as far as the intelligence of Volunteers is concerned. If quick-firing guns are certainly to play an important rôle in future wars, which undoubtedly they will, I think the sooner the Volunteers, to whose hands to a considerable extent I believe the defences of the country are supposed to be intrusted, have a certain number of these guns served out to them, say, one or two even to each regiment, so that they might become familiar with the working, the better. A great many other things have been referred to connected with these guns. General Graham alluded to the supply of ammunition, which is a very important matter. It is a point which has not been sufficiently considered—the enormous addition to the amount of ammunition which these quick-firing guns will entail, if they are to be made use of to any large extent. I may say that even the repeating rifle will raise another question with regard to the supply of ammunition. We shall have to have different kinds of ammunition carts to what are now used; they will be required to hold a much larger supply and will have to be made differently. They will have to be strong and at the same time easily moved; they must have greater mobility. There is no doubt expense is the most serious matter of all. We seem to be all agreed as to what is to be the nature of the coast defence. There has been lately a deputation to Lord Salisbury in which my district, that of the Clyde, was represented. He did not give an altogether unfavourable reception to that deputation, but the Government should understand that they must go to a considerable expense. No doubt they have a great deal to do; we must not expect too much of them, but the point must be faced that our coasts and the mouths of our principal rivers must be put in a proper state of defence. I hope our noble Chairman will do his best to impress this upon the Government.

General Sir LOTHIAN NICHOLSON, R.E., Inspector-General of Fortifications: My Lord and gentlemen, the lecture that Captain Stone has delivered has been undoubtedly one of great interest, but it seems to me to unite two parts of this great subject. He deals with prehistoric days, and he gave a forecast of the future which one might almost call prophetic. There is no doubt that in modern times we have come to see that the old stone forts and armoured forts must be considered as things of the past. Now, my friend Captain Stone deals with them as if they were things of the present. We now treat guns in the way that he indicates. We try to disguise them, but I do think we go beyond even his prophetic times, because we make the gun sink into the ground and they are not even *en barbette*, except under certain conditions. Lord Charles Beresford has told you that the barbette gun is a gun which it is "almost impossible to

see." Well, gentlemen, the gun that we now mount is one that it is impossible to see, without the "almost." Therefore, with regard to what we are doing in the way of fortifications at the present time, what the lecturer has told you is, I may say, rather misleading. I do not like to discourage anybody who takes the trouble to study this important subject; my business is rather to encourage, not only the men of the Engineers and the men of the Artillery, but also try to make civilians take that interest in the subject which ought to be in the heart of every patriotic man. Ten minutes is but a short time to give a man to speak upon so large a subject, and therefore I must try to confine myself to what the lecturer has brought before you. At the same time, though perhaps it may be a collateral subject, I do not think it would be quite right, occupying the position that I do, to pass over Lord Charles Beresford's remarks without comment, though I feel that I ought to speak more on general lines than from the purely official point of view. He and others have touched upon the question of naval defence. Now, I feel very strongly that if this country is ever to make a real and valid defence the only way that that defence can be carried out is by an understanding and a cordial co-operation between the Government, the Navy, the Army, and the civilians. Unless we soldiers take to our hearts the fact that the great strength of England is in the Navy, unless we at once realize that fact, unless we bring the Navy to the front, a fatal day, in my opinion, may, at some future time, dawn upon our shores. The strength of the Navy lies in its power of defence for offensive measures. Those are the principles upon which I and my coadjutor act in deliberating upon the present question of coast defence. I say that advisedly, and I am quite certain Lord Wolseley will agree with me and support me in that view. Now, though that is the case, we also feel that in order that the Navy may have its homes, in order that the ends of the lines—very aptly called the ends of the ropes—may be kept well taut home to their centres of coal supply, the coaling stations are the stations which we are bound to defend. We are bound also to protect to a certain extent the estuaries of our rivers and harbours, but that should not be carried too far. That should be secured to a perfectly conceivable extent by a few cruisers, but not to the point of impregnable defence such as some people seem to think we Engineers deem necessary. On the part of my brother Officers I entirely ignore such a theory as that; that is not the principle upon which we are going. The general view of quick-firing guns is not as the lecturer would try and make us believe; I do not mean to say that he would deviate from what he in his heart believes, but it rather leads to the supposition that the importance of quick-firing guns has not been appreciated, so far that quick-firing guns are a part and parcel, and a most important part of the defences that we are at the present time devising and constructing. If they have not been introduced into the Service the reason is not that the Navy, not that the Army, have not asked for the guns, but because the money is not forthcoming to buy them; this is the real reason. We know perfectly well what is necessary for the defence of the country, but we are not able to get the wherewithal to render those defences as perfect as they should be, and you must not go away with the impression that sailors, soldiers, engineers, and artillerymen are blind to the use of quick-firing guns. Far from it, we are doing everything we can to plant those guns in all our fortresses. At this moment we have taken up estimates for supplying quick-firing guns to every place, and fortresses are being defended very much upon the lines which the lecturer indicates. We are placing our guns on high levels, and as far as sites will admit, dispersing them. Can anything be more satisfactory than that? We are, in fact, in agreement already with what the lecturer tells us we ought to do. That is the line that we are taking, and I think you will all go away from here feeling that at any rate the Engineers are not blind to the necessities of the times we live in. There are one or two minor details referred to by the lecturer and others on which I should like to express my opinion. Colonel Knollys is I think under some misapprehension regarding the value of counterscarp galleries, and seems to think that those who occupy them would be left without access to the work, but such is far from being the case; and the lecturer told you the 32-pr. gun is being used and recommended to be used in the defence of ditches, and he rather drew a comparison between that gun and other guns of an obsolete nature, as if, because the other guns were obsolete, that must be obsolete also. That is very far

from being the case. This is a technical matter which only those technically trained will understand; but I should like to tell the lecturer that the 32-pr. which is being mounted in some places has been found by experiment to be even a better gun, altered as it is with breech-loading apparatus, than the quick-firing gun. No one should be under the impression that our fortresses are going to be armed with obsolete guns. Far from that, the obsolete guns are disappearing everywhere. We are applying to those gentlemen who are kind enough, like Mr. Nordenfellt, to assist us with new inventions. We take advantage of their brains, we pump them as much as we can, and we use every invention they are bringing forward before this country, and as long as they are good enough to help us, you may depend upon it that we, with Lord Wolsley at our head, do all we can to assist the country to become as invulnerable as every patriotic Englishman and woman some day hopes to see it.

Admiral BOYS: With regard to the difference between the machine-gun and the quick-firing gun, the lecturer's definition was that the machine-gun fires bullets and the quick-firing gun fires shell only. I think that is not quite correct.

Captain STONE: It is not quite correct, because the quick-firing gun fires case.

Admiral BOYS: I think one type of machine-gun fires a shell: and now I am up I may remark that I understood Colonel Richardson to express the idea that quick-firing guns were all high velocity guns. Now the 6-pr. caponier gun—

Colonel RICHARDSON: I did not say that—the lecturer spoke of the 6-pr. as a high velocity gun.

Admiral BOYS: I can assure those present that the quick-firing 6-pr. caponier gun, which is I believe approved by the Belgian Government, is not a high velocity gun, and that there is no difficulty in constructing a quick-firing gun of low velocity or a quick-firing howitzer. As a naval Officer I might say one word more, viz.: that if I were a younger man in command of a cruiser, and it became my duty to attack a vulnerable position on an enemy's coast that was partially defended, I would much prefer to find pointing at me the muzzles of ordinary guns than the same number of quick-firing guns of the present day.

Captain STONE, in reply, said: Sir Gerald Graham observed that I had understated the rate of firing of the 3-pr. Maxim gun. I think there was some slight misconception upon that point, and I believe the rate of firing which Sir Gerald Graham actually quoted was that of the 1-pr. The Maxim *automatic* system admits of a much higher rate than I have quoted; but the rate so obtained is unnecessarily high, and the *semi-automatic* system, owing to greater simplicity, is more in favour for all guns, except the 1-pr. Lord Charles Beresford says that the coaling stations should be defended by Marines. In this I am quite prepared to agree, and I think the argument of the defence by the Navy is most sound. His lordship further says that the number of ships which I quoted is not quite correct, in fact very far from correct, and gives the number of ships as 5,718, deducting coast-guard vessels, and so on. But the total which I gave of 700,000 is the number of British ships which enter or leave our ports annually, so that the same ships may possibly be quoted four times over. It is merely to illustrate the extent of the traffic, not the exact number of the ships.

Lord CHARLES BERESFORD: I said the number of British steamers over 100 tons is 5,718. I compared that with the 481 of the French over 100 tons.

Captain STONE: I beg his lordship's pardon, I evidently misunderstood him. The next point was that the sailor now puts the gun in the first place, and by so doing he shows that the Navy is quite free from prejudice. Lord Charles Beresford further makes a strong point by saying that gun-makers are not dealt with on sound business principles by the Navy. This is not for me to enter upon of course, but the episode about Messrs. Wilkinson and the sword blades which has lately been in the papers will tend to explain that matter. With regard to the guns actually supplied, and the want of them, I believe the Government entered into a partnership with some of the Colonies about their defence, the arrangement being that the Colonies were to make the defences and the Government to supply the guns. I am told by gentlemen who have lately come from the Cape of Good Hope that the defences have been ready for some time, but the guns are not yet there. Colonel Knollys said I omitted to mention the point of mobility, with

regard to the quick-firing gun, but I think if he refers to my lecture he will find that it is one point that I lay great stress upon.

Colonel KNOLLYS: The siege battery?

Captain STONE: I meant to imply that, though possibly I have not expressed myself accurately. He says that probably the first parallel would have to be taken to a further distance, owing to the improvements in rifles; that, no doubt, will have to be the case. The distance taken up theoretically is already greater than it formerly was practically. Of course, when we come to blows, it may have to be further still. With regard to the defence of London and the employment of the men who have to fight in the various positions, I think Colonel Knollys enunciates one of the most important principles on which every field defence should be based. Mr. Nordenfelt says that official opposition has practically ceased to exist. Nobody can be more pleased than Mr. Nordenfelt and other manufacturers that this is so. I was thinking, to tell the truth, not only of official opposition, but also of the opposition of certain people who will not go with the times, whether they be in official positions or not. For simplicity of service, which is after all the great thing, nothing can compete with the quick-firing gun. There is a small working model of Mr. Nordenfelt's gun which I have been able to secure, which anybody can see after the lecture; and I think when it is examined nobody will go away with the idea that the system is complicated. His criticisms as to the dealings between the Government and private firms are of course beyond my competence to comment upon. I am inclined to agree with him in advocating the 6-pr. as the best all-round quick-firing gun. When we go in for these weapons to any great extent, probably the 6-pr. will be the gun which will be found the best. His figures with regard to the execution done by the 6-pr. shrapnel and the new time-fuze of course show not merely what can be done with the quick-firing gun, but also what can be done with a good time-fuze, which I am sorry to say we do not at present possess in our Service for field purposes. Captain Verner made some very able remarks, and he is perfectly right in saying that simplicity of service is what we require, and this is what quick-firing guns excel in. Colonel Scott advocates being able to fire from the battery, as well as being able to use the position-finder, and he says that the observation from the observing room may be obscured by smoke or fog. Of course there are two observing rooms, and the observing room employed at any given time is selected on account of the smoke going away from it. At the same time it is a most important point where possible that the gun should be able to be fired from the battery as well as by the aid of the position-finder. Major Barker takes exception to my saying that our powder is bad. I apologize for this expression, inasmuch as I am fully aware of the uniform results obtained by our powder. I employed the word without due thought, the smoke nuisance only being in my mind. I most fully endorse what he says as to the importance of uniform results, and I trust he will not go away with the idea that I meant to throw any blame on our powder, except as to the smoke, which we all object to. I am sorry I conveyed a wrong impression to Colonel Richardson's mind. I did not wish to appear to abuse all existing military institutions in order to advocate quick-firing guns, neither was I aware that I had drawn any comparison between the howitzer and the quick-firing gun.¹ I took the view that the howitzer,

¹ I was unable to reply fully to Colonel Richardson owing to the lateness of the hour; a few words, however, will suffice. My remarks as to the defence of Plymouth neither expressed nor implied that it was "utterly defenceless;" it was merely taken as an instance of the kind of attack which a place of that class might expect. Referring to the position-finder, I said that the directing Officer could fire a "group" so as to hit without fail: this, I think, would be readily admitted by Colonel Richardson, but in this instance he apparently thought that I believed every individual shot would "hit without fail." In quoting from the range table of the 8-inch howitzer, I took my figures from the most recently published handbook: the results obtained at Lydd in 1888, and the extreme difficulty of observing fire correctly, would not encourage us with our present appliances to go further back than we were compelled to. Colonel Richardson says that I "talked about

at a distance of from 1,500 to 1,700 yards, was so formidable a weapon that the great object of the quick-firing guns of the defence should be to attack the working and arming parties and destroy the embryo batteries before the howitzer was able to establish its fire. Captain Salusbury made some remarks about the Gatling, but the subject does not enter into this discussion, which is as to quick-firing guns and not machine-guns. Colonel Harrington Stuart advocates quick-firing guns for Volunteers. In this I have practically expressed my concurrence. The question of ammunition supply is rather a consideration for field service than for fortress and for position services, and as such I have not dealt with it. Sir Lothian Nicholson says he does not like to discourage young Officers, and I think the kindly and seasonable remarks which he made carry with them nothing but encouragement. I am delighted to hear from so eminent an authority that there is no prejudice against quick-firing guns amongst those by whom the matter is dealt with officially. My remarks are scarcely applicable to those who, like Sir Lothian, are far above the ordinary rank and file of the profession. With reference to the 32-pr. converted gun no one can be more pleased than myself, as a gunner, to hear how good that weapon is. With reference to the inquiry of the noble Chairman as to the different natures of quick-firing guns in our own Service, the question was most *à propos*, in drawing attention to the fact that there are so very few of them *en évidence* that none of us know anything about them unless we have exceptional opportunities of studying them. I have to thank you for your kindness in listening to my paper this afternoon, and also to express my warmest thanks to the noble Chairman for the honour he has done me in consenting to preside at this meeting.

LORD WOLSELEY: Ladies and gentlemen, the hour is getting very late, and I am sure a very large proportion of my audience is very anxious to get home to afternoon tea, or if, like myself, they live in the suburbs, they are anxious to get home in time for dinner. It is not, therefore, my intention to follow the lecturer, or those who have spoken, into the very wide subject which he has placed before us in a very careful manner. I fully agree with most of what he has said. I think there is a good deal of information yet to be obtained with regard to quick-firing guns, and a great number of experiments to be carried out before we can be really in a position to know what their full and real power, strength, and advantages are. First, we do not know what the life of a quick-firing gun is. It will have enormous strains thrown upon it, and how long it will last is yet to be found out. We have, as we have just been told, a very small number of them actually in our possession, and therefore we have not perhaps become as fully *au fait* with their working and management as we hope to become in the future. As regards the Navy, I have always taken up the same position, and I am sure my gallant friend Lord Charles Beresford will bear me out in what I now say. It is this: That our country is first of all and especially a maritime country, a great naval Power, and can never expect, under the present condition of things, to be a great military Power. Supposing, therefore, it were known that we had only one million of money to spend upon the defences of this country, I would be the first man to say "by all means spend that upon the Navy." But I believe we are rich enough to have an efficient Army as well as an efficient Navy, and I cannot help feeling that the defence of our coaling stations and military ports is a very necessary adjunct to the Navy, in fact it would be absolutely impossible for our Navy to keep the sea, either in our own or foreign waters, unless the Fleet should always have already under its lee, and not more distant than about a thousand miles, some coaling station to which it can always have recourse to obtain coal, that is the means of propulsion. Without coal the Fleet of the present day can do nothing, and a sure and certain coal supply is, therefore, absolutely necessary to enable Fleets to keep the sea. It is, therefore, of

getting up to 1,200 yards:" a reference to my lecture will show that I said from 1,500 to 2,000 yards. Finally, in saying that it will not advance the cause of quick-firing guns to claim for them what they cannot do, Colonel Richardson is trying to defeat an argument which was never raised: I have, in some cases, *under-estimated* their power purposely, but never the reverse.—F. G. S.

the utmost consequence that both at home and abroad our coaling stations should be adequately defended. And then comes this question, referred to by more than one Officer during the course of this discussion, namely, "What is the most effective means of protecting these coaling stations?" and I would include our home commercial ports also, because every home port is more or less a coaling station. I cannot imagine a more expensive way of defending any coaling station or harbour than by placing in it a ship of war. It is the most expensive battery in the world. You can mount any corresponding number of guns that any ship of war would have, on land for a mere trifle compared with the cost of the ship; and I should, therefore, be the last person in the world, even on the score of expense, to recommend that the defences of these coaling stations should be guard ships, or any other description of war ships permanently stationed there. But beyond that question of cost there is this far more important point to be considered, namely, if you scatter your Fleet all over the world for the defence of your coaling stations and distribute your ships through the various ports to be defended, where will be the Fleet required to keep the sea, and to undertake those offensive operations against the coast of your enemy, which should always be the heart and soul of your great scheme for national defence, both at home and abroad? If we desire to ensure the effective defence for this country we must be able to take, by means of our Fleet, offensive action against our enemy's fleets and coasts. Unless we have a strong Navy it is impossible to do so, but you can never have a strong available Navy if you use it up in the unbusinesslike and expensive plan of scattering its ships throughout the world in the various ports to be defended. I think I might be inclined to criticize the lecture a little if time permitted of my doing so, especially on the topic of sieges to which the lecturer referred at such length, and which is of great interest to us who heard him. I do not think that in describing the sieges of the future he has at all taken into account as he ought to have done, and as any person who has to read a lecture upon sieges ought to do, the immense power of these great modern explosives. I think the explosives of the present day, those enormously powerful explosives which we know to be now at the disposal of foreign Governments, and with which, I am glad to say, we are now experimenting in this country, will completely revolutionize the whole question of fortifications throughout the world. It is, I think, a very doubtful matter if most of the defences which have been erected within the last twenty years upon the Continent of Europe are not absolutely as worthless as if they had been built upon a quicksand. They would, I think, be easily destroyed by the great explosives which are now in the possession of many foreign Powers, and which, without divulging any secrets, I may say, are also in the possession of ourselves. It is very flattering to the lecturer that he should have had such a very large audience. It shows us the very great interest taken by the public and by the Officers of the Army and Navy in the subject which he has brought before us, and I am sure I represent the wishes and feelings of every one present when I thank not only him, but also those who, like my friend Lord Charles Beresford, have given us such very valuable information upon this most interesting subject.

FIG 1.

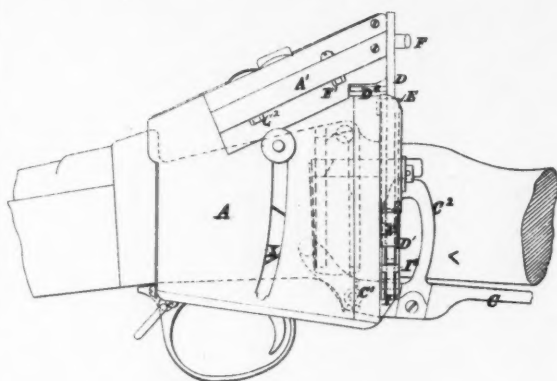


FIG 2.

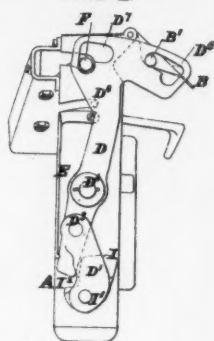


FIG 4.

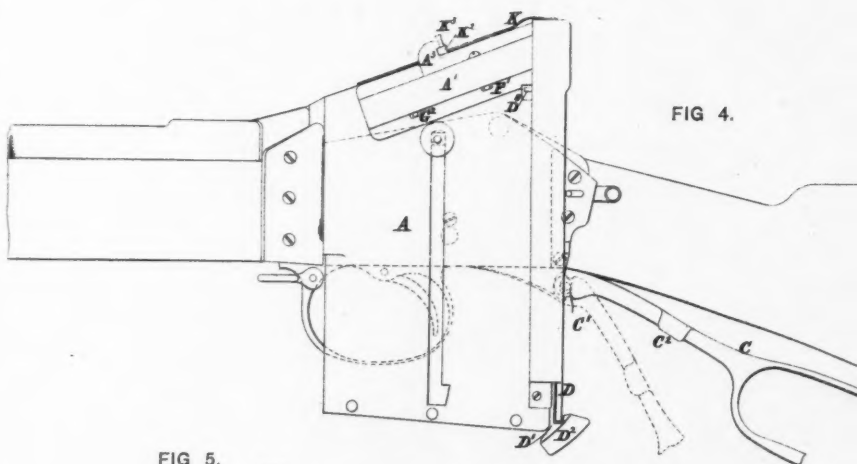


FIG 5.

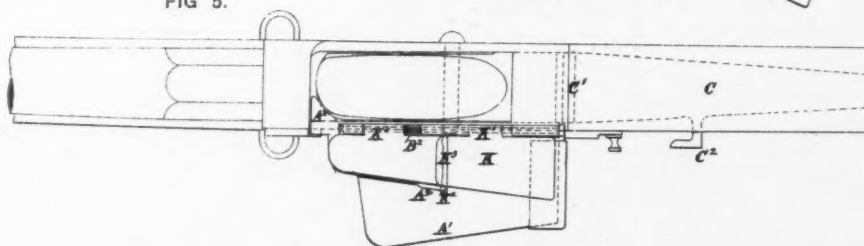


FIG 3.

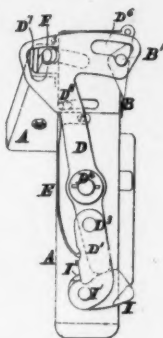


FIG 6.

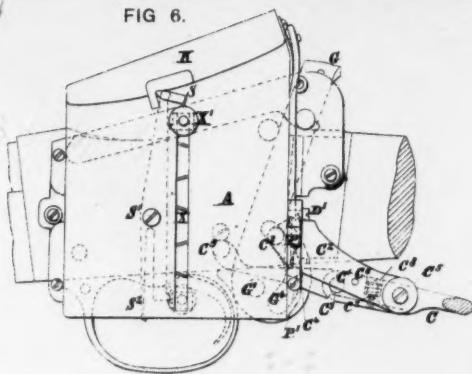


FIG 7.

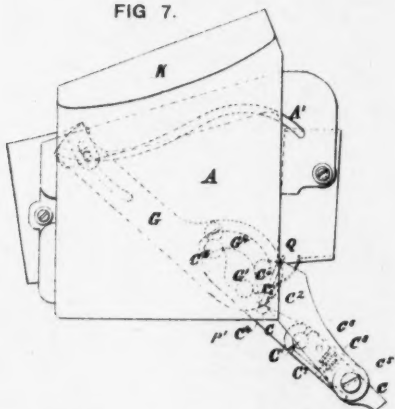


FIG 8.

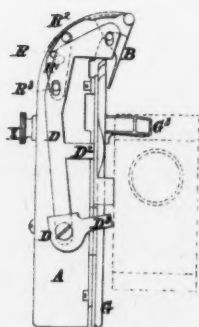
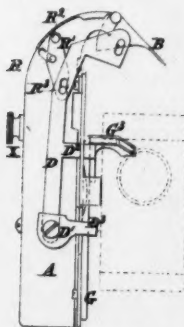


FIG 9.



DESCRIPTION OF MARTINI MAGAZINE REPEATING RIFLES.

Shown by Major GREVILLE HARSTON, of the Canadian Militia.

Friday, January 18, 1889.

SINCE I came from Canada, in August, 1887, to convert the Martini into a repeater, I have been continually pressed by your Secretary to show how it can be done, as it has been so often stated in this theatre to be impossible.

I have here three specimens, two of which have stood severe trials, but I have also several other ways of doing it, which I do not now propose to refer to.

Figs. 1, 2, and 3 represent a Mark IV magazine to hold five full-size Martini cartridges, or seven of the new small-bore 0.303.

Fig. 1 is a side elevation upon the rifle, the only alteration in which is a hinge-joint I put in the lever C at C¹, and on which I place a lug or finger C².

Fig. 2 is the magazine open, having delivered a cartridge into the chamber, and Fig. 3 is the magazine closed.

The action is as follows:—

Upon lowering the lever C the finger C² passes the "Passing Piece" I, which by aid of the spring E immediately returns to its place, the hinge at C¹ giving the lever an extra sweep. Upon raising the lever the upper end of the lever C remains stationary, whilst the lower hinged piece moves upward until the two top faces of the hinge come together. During that time the top of the finger C² presses against the lower side of the passing piece I, and forces it upwards into the position shown in Fig. 2. Upon its commencing to move upwards it forces outwards the heel of the lever D, which as it begins to move, first carries out the lid or door B by its pin B² acting in the slot D⁶, and the top cartridge is thus moved into a line with the chamber and held suspended there, the slot D⁷ having moved across now takes the carrier lever F, and the end forces the cartridge right home, whilst the door remains stationary by its pin passing along the slot D⁶. Meantime the pin D⁸ in the lever D has moved across, and is holding down the head of the next cartridge.

The top of the finger C² now goes on upwards as the breech is closed, and passes clear of the passing piece I, so that the spring E is brought into action, and immediately closes the whole magazine.

With this rifle I have fired 28 rounds whilst 11 were being fired in the best bolt-gun made, and 3 to 1 of an ordinary Martini. When the magazine is empty it can be used as a quick-loader by dropping the cartridge into the hollow of the block, the carrier lever will put

it home whilst closing the breech, and using it thus I have fired three rounds against two in an ordinary Martini. It also acts as a "blind" to the left eye, so that you can shoot with both eyes open.

Fig. 4 shows my Mark III to hold seven large cartridges, and is similar in action to the other, except that the "passing piece" D² moves outwards instead of upwards.

Fig. 5 shows the top view looking down on to the rifle of either of these magazines.

In these two the "carrier lever" is in a box at the top outside the magazine; but in Figs. 6, 7, 8, 9, I show one made with a carrier lever G working longitudinally between the magazine and the shoe of the action, only in this particular one, instead of using a spring and a passing piece, I have cut a slot G⁴ in the carrier lever, and I make the head of the finger C³ act upon the forward part of the slot G⁴, whilst the lever C is moving upwards on the hinge C¹, and thus throw the carrier forward into the position shown in Fig. 7, and then as you close the breech, the continued upward movement of the finger head C³ acts upon the rear face of the slot G⁴, and brings it back into its original position, and a portion of the finger presses the end lever at D³ (see Fig. 9), and forces it upward into the position seen in Fig. 8, and it thus closes the magazine-door and allows the next cartridge to rise to the top.

In all the magazines I use a round top, which by its shape forces outwards the top cartridge into the action of the rifle.

I also sometimes use a lip, or guide, which is shown in Fig. 5 at A², which being at an angle of 45° to the cartridge, allows the bullet to pass along it until it reaches the chamber of the rifle.

Friday, January 25, 1889.

ADMIRAL SIR AUGUSTUS PHILLIMORE, K.C.B. (some time
Admiral Superintendent of Naval Reserves), in the Chair.

THE ROYAL NAVAL RESERVE.

By W. F. CABORNE, Lieutenant, Royal Naval Reserve.

OUR conflict with Russia in 1854-56 brought into prominence the difficulty which existed in obtaining seamen for the Fleet in time of war, and showed the necessity of inaugurating and organizing a system in time of peace capable of overcoming that difficulty.

It was felt that the use of the press-gang of former years, notwithstanding the legality of the procedure, was no longer in consonance with modern views with regard to the liberty of the subject, and it had been found that voluntary enlistment in time of emergency was too precarious a plan to rely upon.

Accordingly, on June 16th, 1858, a Royal Commission on Manning the Navy was appointed, and on February 19th, 1859, its Report was signed.

Among other suggestions, the Royal Commissioners recommended that a force of Royal Naval Volunteers should be raised; such volunteers to consist of merchant seamen, and to number not less than 20,000 men.

The Commissioners said—and their words form the keynote of this paper—"Your Majesty possesses in the Merchant Service elements of naval power such as no other Government enjoys."

In the Report nothing was mentioned with regard to Officers for the new body to be enrolled.

A separate Report, and some accompanying remarks, were drawn up by the late Mr. W. S. Lindsay, M.P., a member of the Commission and a shipowner, whose name is well known as the author of "The History of Merchant Shipping and Ancient Commerce."

Mr. Lindsay contended that it would be useless enrolling a new body of men unless there were Officers to command it, and went into calculations to prove that the Active List of the Royal Navy was quite inadequate for the purpose; he, therefore, advised that Officers of the mercantile marine should be appointed as Officers of the force to be raised.

Incidentally, it may be interesting to compare the Active List of the Officers of the Royal Navy for 1859 with that for 1889, as the

comparison shows that if there was any necessity for the employment of mercantile marine Officers as a Reserve in the former year, the same necessity exists in a greater and more marked degree at the present time.

April, 1859.

Rank.	Employed.	Unemployed.	Total.
Admirals of the Fleet.....	..	1	1
Admirals (all grades).....	18	81	99
Captains	98	262	360
Commanders	173	330	503
Lieutenants	697	333	1,030
Masters.....	266	79	345
Mates	125	33	158
2nd Masters	82	7	89

January, 1889.

Rank.	Employed.	Unemployed.	Total.
Admirals of the Fleet.....	..	3	3
Admirals (all grades)	24	41	65
Captains	112	59	171
Staff-Captains	15	..	15
Commanders	156	71	227
Staff-Commanders.....	89	10	99
Lieutenants	754	105	859
Navigating Lieutenants	13	2	15
Sub-Lieutenants	77	86	163

Note.—Officers at College or on board "Vernon," or "Excellent," for instruction, are considered as unemployed.

It is evident that in 1859 the senior Officers were greatly in excess of requirements. At the same time there was a larger list of junior Officers, but it is fair to state that the Senior Lieutenant had served in the same rank for no less a period than forty-nine years, although he was even then actively employed on board one of the contract steam vessels.

The practical outcome of the Report of the Royal Commission on Manning the Navy was the enrolment by Act of Parliament (22 and 23 Vict., cap. 40) of the Royal Naval Volunteers, now known as the Royal Naval Reserve. Evidently at first it was not the intention to give commissions to Officers of the Merchant Service, but it was found that Mercantile Jack did not present himself for enlistment with the alacrity that could have been desired; in point of fact he appeared to

be under the impression that it was only a plan to entrap him into the Navy, and might turn out to be another form of impressment.

In order, therefore, to disabuse the minds of the seamen and to encourage the movement an Act (24 and 25 Vict., cap. 129) was passed, authorizing Her Majesty to avail Herself of the services of certain Officers of the mercantile marine as a reserve to Her Navy.

I may here mention that times have changed, and that the Officers are now considered to be an important branch of the force. The first commissions were granted in 1862, and from that time the Royal Naval Reserve made headway as regards numbers, but for some years it languished in the cold shade of official neglect. The regulations for Officers have been altered and amended from time to time.

The following table will show the state of the Officers' list at present, viz., January, 1889:—

Rank.	No. authorized.	No. enrolled.
Lieutenants	150	51
Sub-Lieutenants	270	117
Midshipmen	200	137
Engineers	150	14
Assistant Engineers.....	150	4

In accordance with the regulations of 1886, 2 Lieutenants, 5 Sub-Lieutenants, and 2 Midshipmen have undergone twelve months' training in the Royal Navy, and 4 Lieutenants, 2 Sub-Lieutenants, and 4 Midshipmen are now serving.

In addition, several Lieutenants and Sub-Lieutenants have gone through short courses in torpedo and gunnery on board the "Vernon" and the "Excellent," and a few Officers have also been appointed to Her Majesty's ships for the summer cruises.

The paucity of Engineers in the Naval Reserve is noteworthy.

It would be an excellent thing—and probably would attract more men to the Service—if the Engineer Officers were allowed to undergo a period of naval training upon conditions similar to those laid down for the Executive branch.

The seamen, who must be British subjects, are divided into four classes, made up as follows:—

First Class.—Able seamen or men of higher rating, and skippers and second hands of first class fishing vessels.

Second Class.—Ordinary seamen or fishermen.

Third Class.—Boys.

Fourth Class.—Firemen.

The Act of Parliament sanctions 30,000 men, but at present we have—

9,435	First Class.
8,969	Second Class.
312	Third Class.
439	Fourth Class.

Total 19,155

The annual retainers given to the men, in addition to pay and allowances while attending drill, are for the first class, 6*l.*; for the second class, 2*l.* 10*s.*; and for the fourth class, 5*l.*

The men belonging to the first class are also entitled to a pension of 12*l.* per annum, on certain conditions, upon attaining the age of sixty.

The first, second, and third classes are required to drill for 28 days in each year, but the fourth, or stoker class, is exempted from Naval training. The exemption referred to is, I think, a grave mistake.

In the Naval Estimates for the current year, the sum of 229,806*l.* is appropriated for the expenses of the Royal Naval Reserve; this amount includes, however, the pay and allowances of the Admiral Superintendent and his office staff, the pay, victualling expenses, and allowances of the Officers and men of the Royal Navy employed in the drill ships, &c., and other items.

It is difficult, I may say impossible, to ascertain the exact strength of our sea-faring population, owing to the fact that numbers of sailors are employed on board yachts, in docks, &c., who, in consequence, are never brought under the notice of the officials.

According to the Board of Trade Returns for 1887, there were employed during that year in the Home and Foreign Trade of the United Kingdom, the Isle of Man, and the Channel Islands, 17,723 British vessels, equalling 7,123,754 tons, manned by 184,958 persons (exclusive of Masters and Asiatics), of whom 24,046, or 15 per cent., were foreigners.

I may point out that in 1851 the foreign element was only 4·2 per cent.

In 1887 the approximate number of fishermen, including those only engaged in that calling periodically, appears to have been 125,498.

Thus our mercantile sea-faring population, including Masters (say 17,723) and foreigners, aggregate 328,179 persons, and allowing these figures to be practically correct at the present time, our Naval Reserve (19,478 Officers and men) only equals 6·3 per cent.

The presence of such a large number of foreigners in our mercantile marine is a standing danger to the country, and one very difficult if not wholly impossible to deal with in these days of competition and free trade.

I am not very sanguine as to the success of such a plan, for I am aware that the patriotism of many men does not extend beyond what they at the moment consider to be the best interests of their individual pockets, but I think that an earnest effort should be made to bring to the notice of British ship-owners the national evils and dangers

attendant upon the present system of largely employing foreigners, and to urge upon them the importance of instructing the masters of their ships to engage Englishmen, when procurable, in preference to aliens.

In this paper it is impossible to discuss the various causes which have led to this influx of foreigners, reducing as it does, in addition to other evils, the employment available for our own countrymen, but I am afraid that the British seaman has, in a great measure, himself to thank for this truly deplorable state of affairs, and there can be no doubt but that the tender-hearted, well-meaning, and misguided persons who have, at various periods, posed as Jack's best friends have been, in reality, his worst enemies.

I would submit that it is a disgrace to the country, and a national scandal, that so little has been done to utilize our vast mercantile marine as a means of defence in time of war; and when one takes into consideration the large reserves maintained by some of the European Powers, one is struck dumb at the fatuity displayed by successive British Administrations. Our sea-faring population is second in quality to that of no other country in the world, and is superior numerically; accordingly, it is difficult to understand why it is not taken more into account in the scheme of national defence.

The supineness exhibited is, doubtless, one of the penalties that a country has to pay for the blessing of Parliamentary government, and for the pleasure of being ruled by party vote.

I claim for the Naval Reserve that it has, among other advantages, the merit of being a comparatively cheap organization, and it should be remembered that the larger it becomes, the more the individual cost per man will be lessened.

The second class should be reinforced by at least 10,000 more men, and I understand that there would be little difficulty experienced in obtaining that number. The extra annual cost entailed would be less than 80,000*l.*

Although the first class should also be brought up to a greater strength than at present, if possible, I have chiefly advocated the increase in the second class for financial reasons, and also because a portion of the difference which existed between the two classes in 1859 has been swept away by the diminution of the number of masted ships in the Royal Navy.

No matter what any one may say from a feeling of sentiment, and that sentiment may be respected to a certain degree, sail is doomed as far as the Navy is concerned, and rightly doomed, for it cannot for a moment be considered as a factor of any real importance in modern warfare.

Prior to the formation of the Royal Naval Reserve, the country in a measure depended upon the services of the Royal Naval Coast Volunteers, of whom Mr. Lindsay, writing in 1876, remarked, "The Royal Naval Reserve has materially superseded the old Reserve known as the Naval Coast Volunteers, which, it was found, included men in every trade and profession under the sun, except that for which they were intended, and many of whom were of no trade or

profession whatever, having no place of regular abode except the county gaol or local prison, where they were found when their period for drill musters arrived."

The Royal Commissioners expressed an opinion not altogether favourable to the Naval Coast Volunteers, but at the same time recommended that they should be increased to 10,000 men.

The Commissioners, when making this recommendation, had a presentiment that the Second Class Reserve would attract the best men from their ranks; this presentiment was completely fulfilled, and the force gradually died out.

The Naval Estimates for 1859 provided for 40,000 Officers, seamen, and boys in the Fleet; 7,400 Officers and men in the Coastguard, and 15,000 Officers and men in the Royal Marines; in addition, there were about 6,900 Naval Coast Volunteers; making a grand total of about 69,300 Officers and men.

Briefly, the Royal Commission advocated that the Coastguard should be increased to 12,000 men; that a Pensioners' Reserve of seamen and marines, numbering 3,000 and 5,000 men respectively, should be established; that a Naval Reserve of 25,000 men should be raised from the mercantile marine; and that the Royal Naval Coast Volunteers should be brought up to a strength of 10,000 men. When all these recommendations had been carried into effect, the total number of Officers and men available for naval operations would have been 104,000.

In 1887, twenty-eight years after the Royal Commission concluded its labours, the average number of persons enrolled amounted to 45,976 Officers and men in the Fleet, 3,893 Officers and men in the Coastguard, 12,697 Officers and men in the Royal Marines, 2,266 men in the Seamen Pensioners' Reserve, 18,361 Officers and men in the Royal Naval Reserve, and 1,050 Officers and men in the Royal Naval Artillery Volunteers; making a grand total of 84,243 Officers and men.

Thus we find that in 1887, excluding the ordinary naval pensioners who are liable for service until they attain the age of fifty-five, and whose number I have not been able to ascertain, we were nearly 20,000 men short of the strength which had been considered necessary for our national safety in 1859.

I am aware that some authorities do not consider that our deficiency lies in men. It would, however, be interesting to learn to what extent those gentlemen have taken into consideration the wastage likely to occur shortly after the commencement of hostilities.

Times have changed, and it is quite true that modern ships do not carry such large crews as did the vessels of the past: on the other hand, we have a much larger mercantile marine to protect, and some of our outlying possessions and distant Colonies have attained an importance and an amount of prosperity which thirty years ago would have been considered almost fabulous.

Are our various naval forces, as regards the personnel alone, equal to the great task of efficiently guarding the Empire in time of war? The insufficiency of the matériel appears to be generally admitted.

My opinion may be of little value, but I cannot help thinking that we are living in a fool's paradise, and that some day we may have cause to bitterly repent our supineness in not doing our utmost to perfect as far as possible our maritime defences.

In succession to the happily defunct Naval Coast Volunteers, we have a small body of Royal Naval Artillery Volunteers (now numbering about 2,003 Officers and men) which might be augmented, but such augmentation should not be brought about with the intention of in any way restricting the expansion of the Royal Naval Reserve, for it stands to reason that no Volunteer force consisting of landsmen of various professions should or can be allowed to supersede in the slightest degree men trained to a sea-faring life and inured to dangers and hardships from their youth up.

The two bodies have their separate spheres of action and usefulness, and are and must remain totally and wholly distinct.

A seaman is not made in a day, but is the product of years of experience and hard work at sea.

There is a tendency in the present day to underrate modern seamanship, and to assume that when steam is the propelling power, anyone can handle a vessel efficiently.

Those who have had any experience are aware that that is not the case.

The seamanship of the days of Nelson may have passed away, but the manœuvring of the present era requires no less care, experience, judgment, nerve, and skill; and in an engagement in the future, as in the past, the most experienced and capable commander will possess an incalculable advantage.

Not only should the Second Class Naval Reserve be largely added to, but some of the more intelligent among the men should be carefully instructed in submarine mining and torpedo work generally, for the defence of our harbours and for this employment their local knowledge as fishermen should prove invaluable.

The necessity of drilling the Naval Reserve at machine, quick-firing, and the lighter nature of breech-loading guns cannot be too strongly urged, for it appears to be an absurdity and an absolute waste of money to spend large sums in training men in the use of weapons which are practically obsolete, and will not often, in the immediate future, be met with afloat. If it be thought worth while to have a Naval Reserve at all, it seems to me that it is advisable to try and bring it up to a modern standard of efficiency. Exception may be taken to the system of Naval Reserve men drilling in Coast-guard batteries, but one is aware that in many cases it is unavoidable.

The principal objection is that the surroundings of a battery cannot, in the ordinary nature of things, be so conducive to good discipline as are the surroundings of a ship, and discipline is an important, if not the most important, factor in the training of a fighting force, for you may drill the men well, they may be good marksmen and generally understand their duties, but, after all, without discipline they will not rise above the level of an armed mob.

It has been proposed that the men, instead of being instructed on

board the drill ships and in the batteries ashore, should be sent afloat in the Navy for some fixed period, but my impression is that the plan would not work well and would be unpopular, and this latter point must not be overlooked, as popularity is as the breath of life to a voluntary organization.

Personally, I should like to see some of our warships usually laid up in the Steam Reserve, or at any rate some of our worn out ironclads sent to the principal ports and used as drill ships; the present old hulks being abolished.

A considerable saving as regards expense would probably be effected in this way, and the men would have the great advantage of becoming acquainted with a more modern type of fighting vessel.

At the two great centres, London and Liverpool, where the Officers principally attend for instruction, the question of appointing Gunnery Lieutenants to the drill ships (in addition to the Commanders) to superintend the drills, is worthy of consideration for many reasons; if this were done, the value of the results obtained would vastly outweigh the slight additional expense incurred.

Another important and valuable innovation would be the appointment of Gunnery Lieutenants to each District, whose duty it would be to inspect, at uncertain intervals, the drill ships and batteries.

While upon the subject of instruction, I would point out that the men who drill in London suffer under the very great disadvantage of not being able to carry out heavy gun practice as there is no range available, the one at Plumstead having been closed to artillery fire.

It is true that the "President" has a 9-pounder field gun fitted with a Morris' tube, which is found very useful in teaching the men to aim correctly, but it is also necessary that they should be taught to stand fire.

In order to overcome this deficiency, I would suggest that at places where there is only a rifle range a 32-pounder, or some similar gun, should be fitted with a rifle placed in such a manner that when the rifle was fired at the target, at the same moment a blank cartridge would be discharged from the gun.

It would be a great advantage if a gunboat were attached as a tender to the "President," at any rate during the summer months, so that the men might be taken occasionally to the mouth of the river for target practice; in this way they would be taught to aim and fire under some of the conditions of naval warfare.

It is a matter for deep regret that the authorities at the Admiralty did not embrace the opportunity of calling for volunteers from among the seamen of the Naval Reserve for service in the Fleet during the late manœuvres.

In 1869 it was determined to get as many Naval Reserve men as possible to volunteer for a short cruise, and the result was that 12 Officers and 1,700 men embarked on board the different ships of the Reserve Squadron, under the command of the late Admiral Sir Astley Cooper Key.

At the end of the cruise the Commander-in-Chief submitted a

long Report to the Admiralty, in which the following passages occur :—

“It must be evident from the foregoing remarks that I consider the Royal Naval Reserve as a valuable means for manning the Fleet on an emergency or during war ; it includes in its ranks a large proportion of the best seamen of the mercantile navy ; and I do not believe these men would be inclined to desert their colours, or break their engagements, should the country require their services.

“The Officers of the Reserve who volunteered their services during the late cruise are so well known in the mercantile navy that it is needless to mention their great practical experience as seamen and navigators. They rendered every assistance in their power to the Officers in command, and showed an anxious desire for the well-being and good behaviour of the seamen of the Reserve during the time they were embarked.”

In an Admiralty Minute on Admiral Key's Report, “My Lords” said that they considered “the Royal Naval Reserve a most valuable body.”

Sir Astley Cooper Key was of opinion that when Naval Reserve men are embarked on board men-of-war they should not be looked upon as a separate class, but should be mixed up with the ordinary crew as much as possible, and there cannot, I imagine, be two views with regard to the wisdom of this course.

With respect to the armed merchant cruisers, they should in time of war be entirely manned, officered, and commanded by the Royal Naval Reserve, and if this plan were adopted there can be little doubt but that the best possible results would be obtained ; in point of fact, I am in favour of employing the men of the Reserve when practicable as much as possible under their own Officers.

In support of this opinion I would point out that both Officers and men are intimately acquainted with the particular class of vessels to be employed, and, moreover, are accustomed to serving with one another, a consideration of no small value and importance.

Of course, with this end in view, the first thing to be done is to render the Officers thoroughly proficient in gunnery and various other naval acquirements. As we have seen, some of them have already qualified, and if inducement be held out, in all probability many more will follow their lead.

Sir Astley Cooper Key recommended that the Reserve should be brought into closer relationship with the Admiralty ; but nothing appears to have been done in that direction, for at the present time communications to and from the Admiralty are made through the Registrar-General of Shipping and Seamen, and the Board of Trade. The absurdity of this arrangement has probably never been fully realized or appreciated (except by the sufferers), but the natural and inevitable result has been an immense amount of circumlocution, loss of time, and consequent dissatisfaction, and it is very easy to imagine the scope there has been, and is, for a display of the ever memorable tactics of Messrs. Spenlow and Jorkins.

I am bound to admit, however, that for the first few years of the

Reserve's existence, the system, for some reasons, was the best that could be devised; now it must be condemned as unsatisfactory and expensive.

The fact of the matter is we are out of touch with our head—the Admiralty—and I ask whether this is not detrimental to the best interests of the Reserve?

I urge the importance of bringing the Royal Naval Reserve into close touch and communication with the Admiralty, and if this were done, matters would be much simplified, and the belief would be induced that we are somebody's children, and not one of the lost tribes.

If the Naval Reserve is intended to be a fighting force, it should be allied as closely as possible to the Navy through their common head, the Admiralty; if, on the other hand, it is not intended to be a fighting force, it should be abolished at once.

I say, and I say it advisedly, that the more the Naval Reserve is brought into direct contact with the Admiralty the more efficient it will become.

In making the foregoing remarks I wish it to be distinctly understood that I am attacking the established system only, and not individuals, and it is only right that I should publicly acknowledge the courtesy I have always received at the hands of the officials connected with the different Departments.

An objection frequently advanced against the Naval Reserve—and one which was recently brought forward by an American critic—is that in time of emergency great difficulty would be experienced in getting the men together, owing to a number of them being employed at their ordinary avocations in all parts of the world.

Now this stricture, if it be a legitimate stricture, only applies to less than one-fourth of the number of men enrolled; the remainder being employed in the home-coasting trade, the fisheries, and other occupations in the United Kingdom.

Now, it seems to me that the fact of some of the men being scattered all over the globe is a very great advantage indeed; instead of being a weak point, as is generally asserted, it is a strong point.

I am willing to admit that there would be something in the contention of the critics if our interests were confined to the British Isles, but we happen to be in the position that our interests and our possessions lie all over the world, and our war-ships are to be met with on every sea.

Upon the outbreak of war what would happen?

Our Naval Commanders would look around them and ascertain the number of Reserve men to be picked up in their vicinity, and they would immediately take those men to reinforce their crews and to fill up possible casualties, thus effecting a saving of time and expense, as, otherwise, men would probably have to be sent out from England for the purpose. For instance, during the so-called Russian scare, the Shipping Master at Bombay sent constant Returns to the Admiral (the late Sir W. N. W. Hewett, V.C., K.C.B.) of the number of Reserve men in the harbour. At that time the crew of the "Philomel"

had been transferred from that little vessel to one of the harbour defence turret ships, and an addition of, say, fifty men to her complement would have been more than acceptable.

The principal difficulty will probably occur in getting together and disposing of the men who are actually in England, in consequence of there not being, as far as I can learn, any comprehensive and effective mobilization scheme in existence.

There is an old saying that "too many cooks spoil the broth," and we may ask ourselves whether, in the event of sudden danger, the circuitous system I have already commented upon is calculated to lead to rapid and orderly mobilization, or to chaos?

Personally, I am inclined to take the latter view.

Of course, if we have timely warning of the coming storm no particular harm may ensue, but it is quite within the bounds of possibility that in future a declaration of war may come upon us like a thunderbolt shot from a clear blue sky. And then where shall we be?

Any paper dealing with the Royal Naval Reserve, however short and incomplete, should contain at least a few passing remarks respecting the merchant steamers subsidized by the Admiralty for employment as armed cruisers.

Personally I do not share the views of those who express unqualified approval of the arrangements entered into with some of the Mail Companies, whereby certain steamers are reserved for the use of the Government in time of war, for, in the first instance, as was pointed out on a previous occasion in this Institution by Lieutenant Crutchley, R.N.R.,¹ the vessels in question are too long, large, and generally unwieldy for the services required of them. It is true that a few of those ships might be usefully employed as fast colliers in attendance on the fleet, but even then their particular value would, to a great extent, depend upon an efficient plan being devised for coaling ships at sea.

I shall endeavour to show that by withdrawing many of our mail steamers from the mercantile marine in time of danger the country will be weakened rather than strengthened.

It is well known to all here, although it is a fact which appears to be little understood or appreciated by the general public, that in the event of war the question of the food supply of the country will be of the greatest importance, and that if any reverse be experienced by the Fleet it will be a subject the gravity of which cannot possibly be overrated.

It is a fact that cannot be too strongly impressed upon the general public—and it is one that few persons will endeavour to controvert—that although our coasts may be well defended, and invasion rendered impossible, yet, should disaster overtake the Fleet, and our merchant ships be unable in consequence to keep the seas, this proud and wealthy country would have to yield to its enemies owing to the presence within of a mighty and irresistible foe named Hunger.

¹ See Journal, vol. **xxx**, No. 134.

The quantity of food ordinarily in the country has been variously estimated as equal to the requirements of the people for a period of from three weeks to three months, and our annual imports are something enormous.

So vital is the matter of the provision supply that I have thought it well, instead of naming a lump sum, to draw up a condensed table showing the value of our sea-borne food-trade for the year 1887, the figures having been taken from the "Annual Statement of the Trade of the United Kingdom."

1887.

Description.	Imports, value.	Exports, value.
	£	£
Oxen, bulls, cows, calves, sheep, lambs, and swine	6,149,048	..
Meat of all sorts, including bacon and hams.	14,344,295	831,138
Butter, butterine, cheese, and lard.....	18,009,326	815,020
Wheat, flour, and other corn, grain, and meal	48,290,793	734,650
Tea, coffee, and cocoa.....	14,941,171	4,635,365
Eggs.....	3,085,681	..
Fish	2,032,423	2,027,695
Fruit, almonds, and nuts for fruit	6,770,113	570,704
Hops.....	427,753	32,096
Confectionery	718,202	215,592
Onions, potatoes, and other vegetables.....	2,191,947	..
Poultry, game, and rabbits.....	722,235	..
Rice.....	1,873,551	1,080,769
Sago, and other farinaceous substances	1,061,312	127,762
Spices	1,616,186	1,020,019
Sugar	16,861,974	1,053,408
Yeast, dried	774,028	..
Provisions, unenumerated.....	..	707,602
Isinglass and liquorice	181,779	..
Biscuit and bread .....	..	550,297
Wine and spirits.....	7,700,176	1,997,854
Tobacco, cigars, and snuff	3,399,521	426,839
Ale and beer .....	..	1,678,360
	£151,151,514	£18,505,170

Thus it will be seen that during the year under review the value of the food imports exceeded the exports by the sum of 132,646,344*l*.

The reports already published are close approximations only, but from them we find that in 1888 the imports of articles similar to those already enumerated amounted to about 159,788,520*l*., and the exports to about 21,772,429*l*.; the imports exceeding the exports by about 138,016,091*l*. In 1859, the corresponding figures were 57,074,651*l*., 10,387,051*l*., and 46,687,600*l*.

Now, should we be engaged in fighting against a powerful maritime State, it is pretty certain that none of our sailing ships would put to sea, and it is also very questionable whether any of the weak-powered steamers would venture to do so (unless England, by the possession of a very powerful Navy, was the assured mistress of the seas), owing to the heavy war risk that would be imposed. Of course, there is the old system of convoys, which, in some cases, might be resorted to for a few of the slow boats, but it is very doubtful whether it will be extensively employed in the future. It will be within your recollection that Admiral Colomb delivered a very interesting lecture in 1887, in this Institution, upon the subject of "Convoys, are they any longer possible?"¹ The large mail steamers, then, would be required to carry our food supply, and those vessels, on account of their great speed, would be practically safe from capture, would not require guns for defence, and would, I imagine, have to pay a comparatively small war risk.

Possibly I shall be told that the "Sandfly" succeeded in capturing a number of our largest and finest steamers during last summer's manœuvres. Doubtless she did, but it was during a period of profound peace, when Captains of merchant ships were not likely to burn extra coal or use special endeavours to get out of the way; in point of fact, they did not trouble their heads about the matter, and, as far as this part of the evolutions is concerned, we have learned very little. Would the "Sandfly," had she been a real enemy, have captured the same ships in war-time? It is very doubtful for many reasons.

What I particularly wish to urge is that by taking up the mail steamers for armed cruisers the indispensable food transport of the country is directly reduced.

It must be borne in mind that great speed is an absolute necessity where mail steamers are concerned; without great speed they cannot carry on their ordinary business. Now, most of the owners of the other steamships do not require a rate of more than ten or eleven knots, at the outside, for their respective trades, and it would be a loss to them if they were to put higher power into their boats, as they would be locking up an amount of capital which, under ordinary circumstances, would be non-productive.

The late evolutions have shown the necessity of having a large number of fast cruisers, and if the country is to depend, in a measure, on armed merchant ships during war, I would submit that instead of paying large sums for mail steamers, which, as a rule, are unfitted for the work, it would be far better to offer terms to some of the ship-owners at present owning comparatively slow boats to induce them to build fast and suitable ones—say, 18 or 19-knot twin screw vessels of about 3,000 tons gross register.

By adopting this scheme the country would be materially strengthened, at, I venture to think, a not unreasonable expense.

In all cases, the steamers selected for cruisers, whether under the present or proposed system, should be commanded by Officers of the

¹ See Journal, vol. xxi, No. 139.

Royal Naval Reserve, and a certain number of the Officers and men should belong to the same service.

Lieutenant Crutchley has drawn attention to the fact that there are no petty officers in the Naval Reserve, and I thoroughly agree with him that it would be much to the advantage of the Service, and would greatly increase its popularity, if it were known that good conduct, attention, and ability would bring to the best and steadiest of the men an opportunity of obtaining a little well-earned promotion.

Fair prospects with regard to pay and advancement are great incentives to energy and zeal in every class and position in life.

Having recently had the honour of serving for upwards of twelve months in the Fleet, I am aware that this is a difficult question to handle for many reasons, the least important being the item of expense, which would be insignificant, and one of the more important being that such petty officers would only be available for service in merchant cruisers, for, however good men they might be, they would not have that knowledge of the minute routine and customs of a man-of-war which would be a *sine quâ non* for men in their position, and without which a considerable amount of friction might occur with the higher powers.

It is true that it might be made a condition of promotion that the men selected should serve, say, six months, in a man-of-war before being confirmed in their ratings.

It is also probable that, from a mercantile marine point of view, it would be advisable to select the petty officers from among those who hold similar ratings in the merchant service. "Where there is a will there is a way," and for vessels manned by Naval Reserve crews, Naval Reserve petty officers would be invaluable and indispensable.

Merchant shipping is seldom mentioned in this Institution without the Declaration of Paris being alluded to, and the question has several times been discussed as to whether it would be lawful for a merchant ship to resist capture.

The days of cheap guns have passed away, and, owing to the great cost of modern weapons, no merchant vessels will, in all probability, be armed by their owners; consequently, the matter as regards the ordinary merchantman will not be likely to crop up practically.

Here it may not be altogether unprofitable to consider for a moment what is meant when we speak about the sea-borne commerce of this country.

In 1859 the gross value of the imports and exports amounted to 334,875,330*l*.

Passing onward, I find from the "Annual Statement of the Trade of the United Kingdom," that in 1887, 676,429 vessels, equalling 149,642,960 tons, entered and cleared at our various home ports, and of this number 50,647 vessels, equalling 19,062,590 tons, belonged to foreigners. The total value of our imports and exports during the same year amounted to 642,990,725*l*., of which 165,834,322*l*. represented the direct trade with our Colonies and possessions.

As I have already explained, the Trade Returns, as yet issued, for 1888, cannot be considered as strictly accurate, although they are approximately so, but from them we learn that last year our imports

and exports are estimated to have increased to the goodly sum of 684,329,410*l*.

The preceding figures are, in themselves, stupendous, and yet we must remember that they do not include our inter-colonial trade, or our colonial trade with other countries.

When to all of the above we add the value of our mercantile marine (said to be worth about 93,000,000*l*.) and the value of our sea-ports and towns on the coast of the British Empire, we may well ask ourselves whether 13,776,572*l*. (the current Naval Estimates) is a sufficiently large insurance premium to pay upon the vast sums at stake, and, in fact, upon our national existence?

Assuming that the Naval Estimates for 1859 (9,613,181*l*.) represented an adequate expenditure upon the Fleet for that year, and basing our calculations entirely upon the value of the imports and exports, and their subsequent increase, our expenditure upon the Navy during the financial year 1888-89 should have amounted in round figures to 20,000,000*l*.

Unless England is in a position to prove herself mistress of the seas, by the possession of a powerful Navy such as is advocated by Lord Charles Beresford—a Navy capable of meeting upon equal terms the combined fleets of any two of the Great Powers of Europe—a Navy capable of making the enemy's coast line the frontier of her defences—how much of her stupendous wealth, and how many of the sources of that wealth, will remain to her at the conclusion of any great war in which she may be engaged?

There are people who exclaim, "Oh, it will be all right in war-time! We shall transfer our ships to a foreign flag, and then our commerce will be carried on as usual under neutral colours." I ask, will the trade and will the vessels so transferred ever again return to the British flag? Has the trade which was, under similar circumstances, transferred from the American flag ever returned to it? And has not history a playful little knack of repeating itself? I leave these questions to be answered by more competent authorities than myself.

Assuming that the neutral flag covers the cargo, with the exception of contraband of war, a pertinent question forces itself to the front. What is contraband of war? The general reply would probably be arms, ammunition, and the ordinary munitions of war. But we must remember that France, in recent years, when coercing China, claimed that rice came within that category, and presuming that the former country, either alone or in conjunction with some other Power or Powers, was engaged in a struggle with ourselves, what is there to prevent all descriptions of food being declared liable to capture?

Again, there are some men who maintain that no civilized enemy will bombard or otherwise molest our undefended sea-ports and coast towns. It may be consolatory to many to hear this opinion, but I cannot say that I attach much weight to it. Probably no enemy will bombard a defenceless place if it be possible to obtain a heavy ransom without doing so; the ransom not being forthcoming on demand, it is very possible that there will be some future employment provided for the bricklayers.

I do not profess to know much about international law, but this I do know, that *law of any sort is effective only when it can be duly enforced*. Abolish the police in England and see how long the law will be obeyed !

No doubt so-called international law will be respected, the statements of sickly sentimentalists to the contrary notwithstanding, just as long as its clauses are in agreement with the wishes and interests of the nation which happens to prove itself strong and powerful in the day of battle ; let it in any way clash with those wishes and interests, and it will be swept away into the limbo of the past.

One of my principal objects in coming before you to-day is to advocate, as far as in me lies, a steady and progressive policy with regard to the auxiliary portion of our first line of defence.

Unfortunately, we in England are too much given to putting off preparation for war until such time as imminent danger stares us in the face, and then our efforts are of the spasmodic, unsatisfactory, and highly expensive order.

It behoves us to prepare for the war—to which the wars of the early part of the century will be but as child's play—which it does not need the foresight of a prophet to foretell will inevitably take place before many years have passed over our heads.

The visionaries who profess to look forward to the time when there will be universal peace and brotherhood among the nations, and to the day when all international disputes will be settled by arbitration, must feel much discouraged, one would imagine, when they read that the Continental Armies of Europe, including all Reserves, aggregate about 28,000,000 of men.

Let us pray—let us hope—that the arbitration theorists may never see their wishes fulfilled, as, should they do so, our great Empire would be called upon to play the part of a plump pigeon handed over to the tender mercies of a commission composed of hungry and greedy hawks.

Europe is in arms ! Do our countrymen sufficiently grasp the meaning of those words, and are they aware of the envy and avarice which our vast commerce and stupendous national wealth not unnaturally excite in various parts of the world ?

To return to our subject. There are some persons who appear to take a particular and peculiar delight in running down the Royal Naval Reserve.

We may be, and are, primarily merchant seamen, and we are not ashamed of the fact ; but have merchant seamen never played an important part in war ?

I think that the annals of the past will show that merchant ships manned by merchant sailors have given a very good account of themselves upon more than one occasion.

Do those who affect to sneer forget that in all the great sea-fights of the days gone by, the ships of the Royal Navy were largely manned by merchant seamen, men who had enlisted or been forcibly seized by the press-gangs ?

The Royal Naval Reserve is not perfect. Far from it ; but its

imperfections are not so great as are sometimes laid to its charge and are due less to the personnel than to the system.

Of the men, taken as a body, the country has no reason to be ashamed, and as far as intelligence is concerned they are not inferior to their brethren of the Royal Navy.

The fact of the matter is, that although a considerable amount of money has been spent during the last thirty years, but little real encouragement has been offered to Officers or men, and, moreover, they have been hampered by the peculiar control upon which I have already animadverted.

In the way of encouragement much might be done without the country incurring any expense whatever. For instance, if the Admiralty were to notify that when taking up transports preference would be given to vessels commanded by Naval Reserve Officers and partially manned by Naval Reserve men, provided they were in other respects suitable for the employment, ship-owners who now eye it askance would suddenly discover hidden virtues in the force. It is wonderful the way in which the pocket sometimes affects the understanding.

Then, again, the questions of promotions, retirement, and the privilege of wearing the blue ensign, require to be dealt with in a more modern and generous spirit.

In writing this paper, I have endeavoured to steer clear of grievances, notwithstanding their existence, and it would be unbecoming on my part to unduly criticize the regulations in this Institution, but I feel that I should fail in a plain duty did I not express my personal and sincere regret that those in authority have seen fit to abolish the Extra Master's Certificate of Competency as one of the qualifications requisite for obtaining a Lieutenant's commission, for I cannot look upon it as anything but a retrograde movement, a levelling down instead of levelling up.

I am bound to state, however, that some Officers disagree with me upon this point; nevertheless one or two of the dissentients to whom I have spoken think that there should be some qualifications required over and above the ordinary master's certificate.

When alterations in the regulations are in contemplation, it would be an advantage if some of the Officers were asked for an expression of opinion with regard to the proposed changes, and I venture to think that such a proceeding would in no way tend to weaken the supreme authority of the Admiralty.

I will go farther still, and say that it would be highly beneficial if it were found feasible to attach a Royal Naval Reserve Officer to the Admiralty.

Sir Astley Cooper Key, as we have already seen, when reporting upon the Naval Reserve, said that he did "not believe these men would be inclined to desert their colours, or break their engagements, should the country require their services," and I beg most emphatically, and in all sincerity, to be permitted to endorse that opinion.

In the present Royal Naval Reserve we have the germ, the nucleus I may say, of a valuable defensive and offensive force, and although

I have only advocated an immediate addition of 10,000 men, yet we ought not to rest until every sea-faring man in the kingdom capable of bearing arms has been efficiently trained in their use.

I may be accused of having wandered from my subject more than once, and I am aware—painfully aware—that I have put my views before you in a very feeble and clumsy manner, yet I venture to think that every point I have touched upon is indissolubly linked to and bound up with the question of a strong and efficient Navy and a strong and efficient Naval Reserve.

At last, thanks principally to the exertions and earnest warnings of several distinguished Naval Officers well known to this audience, the country appears to be awakening from the torpor and lethargy into which it has been plunged for so many years, and is beginning to see the urgent necessity of a larger expenditure upon the Fleet; accordingly there is now a prospect that in the immediate future the matériel of the Royal Navy will be considerably augmented.

Unless the personnel of the Royal Navy be also largely added to in time of peace, the country will in time of war be greatly and in an increased degree dependent upon the services of the sailors of the mercantile marine as represented by the Royal Naval Reserve.

Such being the case, it is imperative that no exertion should be spared, and no stone left unturned, that will in any way tend to the future welfare and increased efficiency of that body.

Before concluding, I should like to say that this paper was in all its main points written some months ago, but that I have recently made a few alterations and brought necessary figures as closely up to date as possible.

Thirty years have elapsed since the Royal Commission on Manning the Navy presented its Report, and numerous, wonderful, and great have been the changes that have taken place in the maritime world during that period; accordingly I must confess that I should much like to see a Commission or Committee, consisting of Officers of the Royal Navy and Royal Naval Reserve, appointed to enquire into the best means of improving the organization and efficiency of the important national auxiliary force known as the Royal Naval Reserve.

Admiral Boys: Perhaps I may be allowed, Sir, to open this discussion by offering a few observations on this able paper which we have heard with so much interest. I may say, on the part of the Council, that they always welcome young Officers who will take the trouble to collect information upon any subject connected with the Services, and have the courage to bring that information before this Institution. I speak more particularly of Officers who are not immediately in the direct line of the Services, but who hold positions such as that held by Lieutenant Caborne in the Royal Naval Reserve, and Officers in the Volunteers, both military and naval. I will just touch upon two or three of what I consider to be the important points in this paper. Generally, I think the lecturer is to be agreed with, though perhaps some little differences of opinion will arise which will probably come out during the discussion. Looking down the list of Officers employed in 1859 and 1889 in the Royal Navy, the actual difference is that in 1889 we have 209 less Officers employed than in 1859, and considering what they had to do then and what they have to do now, the work of the Navy is so materially increased that I think this reduction does not present a promising aspect. The strongest point of the paper is that which is contained in a sentence to this effect: "Are our

various naval forces, as regards the personnel, alone equal to the great task of efficiently guarding the Empire in time of war? The insufficiency of matériel appears to be generally admitted." I think that is really the gist and burden of the whole question. There may be at this moment, and I believe there are, sufficient Officers and men in the Royal Navy and Naval Reserve to man the ships we have at present available for service, but that scrapes together every man on whom we could lay our hands. I understand the gunnery, the training, and the harbour ships will be emptied in order to complete the crews of ships which are available for active service. I do not think we have sufficiently anticipated the waste that must occur in the first few months or the first year of a naval war. The duties, especially of small vessels, will be very severe indeed. I think the experience of our fleet during the last summer's manœuvres shows that the crews of our small vessels at sea, especially the torpedo-boats and torpedo-catchers, will become in a few days thoroughly exhausted and must be relieved; and considering the small complements now appropriated to our ships, this will involve the actual necessity of a large increase in the Reserves. The smallness of the crews is one point well worthy of consideration at the present time. The crews have been decreased in far too great a proportion, and I think that this is to a great extent due to the Constructive Department of the Admiralty. One chief object of the Constructors of the Royal Navy is to reduce the weights to be put into a ship as much as possible, and every addition to the crew increases the weight in the matter of provisions, &c., and adds to the difficulties of the Constructor. With regard to this table of imports and exports, on looking over it, almost the only items in which the exports exceed the imports are those of biscuits and beer, and for both of these we depend upon the item of grain, for the flour and the malt to make them. I will, however, leave to others the task of discussing further points in this lecture. The urgency of the question of the Naval Reserves cannot be over-estimated.

Captain CURTIS: Having served in one of the Coast-guard ships in 1860 and 1861 at Liverpool, I think I can explain how it was that the men (Coast Volunteers) got mixed, and how they had so many very inferior men. It was in consequence of the Captains vying with one another who should get their number of men first, and we agreed in the Ward-room at that time that that was the cause of their enlisting so many men who were not efficient—not fishermen, as was the intention. There is nothing like practice. I was speaking to a fisherman mending some whelk baskets at King's Lynn. I said to the man, "Why don't you belong to the Royal Naval Reserve?" He said, "I did for seven or eight years, but I found they wanted to drill me when it was the fishing season." Now when you come to consider that 2*l.* 10*s.* is a second-class man's pay for retainer, you will see that it is not encouragement enough for a fisherman to belong to the Royal Naval Reserve, to be taken very often at his fish harvest. It would be very uncharitable to say that these men are not as patriotic as we are. I believe when you refer to patriotism, you should refer to the merchants or the world at large. The public get the benefit of the services of our soldiers and sailors, and the least the country can do is to pay a fair price for those services. I say we ought to get ten thousand men at the very least from the fishermen, and not only that, but we ought to improve the force. We have now only four hundred and fifty boys in the third class. There must be many boys in the fishing smacks that are quite eligible to be put in the third class, and if they had a little more pay you might induce these lads to join the Service, and thereby encourage as it were a growing force. With respect to drill ships, I think it quite possible for the Government to subsidize tugs for vessels on the northern and the eastern coasts, and to make those vessels eligible for steam tugs in peacetime, and also gunboats when required. In the event of war our fisheries would be very much curtailed in consequence of foreign gunboats, if not protected by a local force, and those are the very spots on which we should have efficient gun-vessels. I think Admiral Sir George Elliot has written a great deal on this subject. I quite agree with the lecturer that the pay is the keynote of the whole

¹ I can confirm what Commander McLaughlin said about some of the Coast Volunteers not going aloft. On one occasion, when anchored at single anchor at Holyhead, the sails loosed and hauled to a bowline, a sudden squall came on, and the

affair.¹ I must congratulate Lieutenant Caborne on his paper. I think the Service must be very proud of him.

Admiral P. H. COLOMB: I think we must all have felt, during the reading of this paper, that we were hearing that which is to a great extent the product of the change of feeling which is taking place in this country. And I think we must also have felt that the expression of this change of feeling was exceedingly well put by the lecturer. As sentence after sentence came from his lips, I could not help saying to myself that we were listening to a paper considerably above the average. I think the lecturer carried most people with him in the way that he put the general case; but what was dwelling upon my mind throughout the whole of the paper was that our difficulties from beginning to end, in this naval question, have been that we have never had, from the departure of the days of sailing ships till now, any definite conception of what we were going to do in naval war. You have so many thousand men of the Royal Naval Reserve: what are you going to do with them when you have got them?² If you look at the material part, the ships in which these men must fight, you see that you have a great many more men than you can in any way at present dispose of. Then you say, "We have not anything like the number of ships we ought to have for the work they are going to do." But nobody can tell what the work is that they are going to do, and therefore these ships have been kept down to the small number at which they stand at present, and therefore it was that nineteen years ago Ministers were found to come forward and to treat the Navy of this Empire as a sort of necessary evil—to be kept down and to be screwed up as sharply as it was possible to screw it. But, not only so, the Ministers of those days were cheered on by the whole country for carrying out this highly national policy. We recognize that a change has come over the spirit of the country, and a paper of this kind, appearing at this moment, will have a much greater effect on the country generally than it could have had even last year, because people begin to think, "What does this all come to?" and the way in which the lecturer has put point against point, and matter against matter—bringing them both together—will give anybody reading the paper, or an abstract of it, subject for thought which will turn his mind in the right direction. I could not help feeling that the lecturer was striking a right note when he spoke of the Government looking out for a smaller class of vessels as auxiliaries, and staying its hand in making terms with these large class ships; and it is also not impossible that the proper crews of these ships will be Naval Reserve men. Anyone who has studied what the proper functions of the Navy are, will probably think that, on the outbreak of war, the hiring of a number of auxiliary merchant vessels will be a necessity, and if we bring together the Naval Reserve and the auxiliary vessels we shall find, in that idea, our hands much less tied than they are at present. Advertising to the numerous entries and exits of ships round our coast, with a total value of imports and exports of nearly 700,000,000*l.*, as the lecturer mentioned, it is obvious that they must have some protection near our coast, and it must be a very considerable protection, and a very widespread protection, if they are to go in and out freely. It appears to me, for that service alone, we should require a very considerable auxiliary fleet, and that if the Government saw their way to adopt the proposal of the lecturer, and to give small subsidies to ship-owners—especially to those who were engaged in trade in the vicinity of our own country—and were to induce them, when they built new ships, to make them more suitable for the purpose of protecting the coast trade, and if we looked upon these as properly manned by the Naval Reserve, we should then have a distinct object in the maintenance of the Naval Reserve with its Officers in a proper state of efficiency. The difficulty

men were required to haste aloft to furl sails. Some eight or ten declined to go—said their heads would not bear it; one man said a load of muck had fallen on his and injured him. They were put under the sentries' charge and afterwards discharged as unfit. I am certain no fisherman would refuse to go aloft.—J. C. C.

¹ It would be very much to the advantage of fishermen to belong to the Reserve in event of war, as many of the trawlers would not have employment for fear of capture or destruction.

at present is that we really do not know exactly what it is that we ought to do. There were many points that I took note of as the lecturer proceeded, but I should not like to intrude too much on your time: I would not intrude on your time at all but that I fear few of us are going to be stirred up to do our duty on this occasion. With regard to the question of engineers and stokers, I do not know what causes this small number of entries of engineers; it certainly is very remarkable. I was not aware that it had been so very small. Engineers and stokers are a class that are thoroughly trained for the work they would have to do. As they stand they are capable of doing their work on board any ships, having already been trained to it. I do not disagree with the lecturer in the belief that it would be advisable to add to that training the training in the use of arms. I quite hold with the view that a training in the use of arms and training in discipline, if only for a short time, is an advantage. The foreign element in our mercantile marine is an evil which we have been deploring for years, and the worst of it, as far as I can understand, is that it is a continually growing evil. I have been told since I came into this theatre, by one who is eminently qualified to know, that why our mercantile marine men sometimes get the bad characters they do (which are not always deserved) is, that the best of them quit the Service unable to stand the rough way in which they are obliged to live, when mixed up with all sorts of nationalities and in close contact with them. But the difficulty here is, that if we will not look upon the mercantile marine as a national affair—as a standing part of the British Empire to be upheld by legislation—I do not see how we can alter things. As far as I can see, as long as the mercantile marine is open to competition we cannot touch it by legislation; and though I am, so to speak, a free-trader, yet I must say I never have been a free-trader with respect to our mercantile marine. I have always thought that our national existence may depend upon the sustenance of that grand body, and that no Government would be ill-advised which gave some advantages to our ships, while at the same time they compelled them to do something in the way of a greater employment of the British themselves, instead of foreign races. I was glad to hear the lecturer say that modern seamanship was seamanship still; that the seamanship of steam days is just as important as the seamanship of sailing days—just as difficult to be learned, and just as important when it is learned. I do not for one moment believe in that opinion—which sometimes grows—that anybody can go on board a steamer and do what he likes with her. I feel with the lecturer in his complaint that the Royal Naval Reserve is not in closer touch with the Admiralty. If it can be brought into closer relation it would be better both for the Admiralty, as enlarging their sphere of action, and for the Reserve itself. The scattered state of the Reserve has often been alleged as an objection to it, and I think the lecturer usefully met that by pointing out the fact, which I had forgotten, that less than one-fourth of it is all that we could not lay our hands on at home if war were declared to-morrow. I have always heard from every Officer who has had to do with the Naval Reserve, that there is no doubt but that they would flock to the colours directly they were wanted. I am sure we may put implicit trust in them. I think we had good proof of this when at one time there was a great war scarce—that was the time when there was the greatest enrolment of Naval Reserve men. I did not like to hear the lecturer talk about “a bolt from the blue.” It is an enemy of mine, that “bolt from the blue,” for the moment you begin to say sudden unexpected things will happen, and you cannot be prepared for sudden things, then people say, “Don’t let us prepare at all.” That is the general argument which goes on all round, and “as you cannot foretell everything that happens—and things may turn out differently from the way in which you foretell them, therefore let us suppose that we cannot foretell anything, and do not let us be prepared for anything,” which is a policy I do not like. I think the lecturer’s table of food supply is most useful. I should like to see it published pretty widely. We are so accustomed to be told that we shall starve, that we seem sometimes to accept the position and act on it. But when you put before a man the sort of things which he is not going to get, and tell him that he is not going to have one loaf instead of three, and that he is not going to have any coffee or tea for his breakfast, he is apt to think about it a little more closely than he would if he were only told that he was going to starve in a general sort of way. I should be glad, if it were possible, to see

something done in the way of Reserve petty officers. I do not know enough about the subject to say if it would be possible to do it, but I think the lecturer is right in supposing that on a declaration of naval war there would be a considerable laying up of sailing ships and of the slower class of steamers, and that therefore if we organize beforehand these sailing vessels and the slower class of steamers, and make arrangements for obtaining their men when we want them, and training them, I think we should be pretty certain always of a large supply in that way. But our scheme, whatever it is, must be a complete scheme. We must know what ships we are going to have before we can settle what men we are going to put in them, and we must always work side by side, ships and men, and men and ships, or else we never can have a perfect Navy.

Commander C. McLAUGHLIN: There are only two points I should like to speak about, since they have been alluded to by the lecturer and the last speaker. I was Second Lieutenant of H.M.S. "Donegal" at Liverpool, in 1868-69, to which ship about 1,000 Royal Naval Coast Volunteers came for drill each year,¹ and I was responsible that their instruction drills were carried out; but we found that the men were not up to much; one reason being that they were not the men they represented themselves to be, and we could not detect it. A man would bring a parchment in a little tin case, stating he was John Snooks, a fisherman; but when sent aloft for work he tumbled down, and turned out to be James Stiggings, a tinker, the latter having taken Snooks's parchment and come up for drill. Whilst in H.M.S. "Donegal," I was in that cruise which the lecturer has spoken about when the Royal Naval Reserve were called out. We embarked nearly 1,000 men and 2 Officers as the Liverpool contingent.² The question then came what duties were the Officers of the Royal Naval Reserve to do? and I think our Captain telegraphed for instructions to the Admiralty, who replied, "That he might make his own arrangements." One Officer, who was a very senior Lieutenant in the Royal Naval Reserve, I think about the most senior, undertook to be the medium between the Royal Naval Reserve men and the ship's Officers generally; and the other one was assistant pilot, *i.e.*, helped the navigating Officers; but that was our difficulty, we did not know what to do with the Officers then. I do not know whether that difficulty has been now overcome, but think it has hardly been touched on by our lecturer in the very able lecture he has given us to-day.

Lieutenant W. S. BADEN-POWELL (Royal Naval Reserve): I should like to offer one or two remarks upon this subject, and the very last words of the last speaker, I think, go to the bottom of the whole question of the present status of the Royal Naval Reserve in regard to the Navy. The Royal Naval Reserve has been a child badly brought up. It was brought up in the first place without Officers, the Officers were appointed to the Royal Naval Reserve, but their status was not understood on board ship. I believe, at the present day, if a body of the Royal Naval Reserve were sent on board a man-of-war, that there would be some difference of opinion amongst the Captains and Officers of the ship as to what duties these Royal Naval Reserve Officers were competent to perform and ought to perform on board. The fault, I think, is the training. I hold that the Naval Reserve Officers ought to be regularly trained on board a man-of-war—not on board a drill ship; either on a man-of-war at sea or on one of the naval drill ships, such as the "Excellent," or the "Vernon," because they would there learn those details which alone can fit them to take their proper station when they go to sea in a fighting ship. Fraternity would then exist without a breach between the two branches of the Service. I have mixed a great deal myself with naval Officers, and have noticed a sort of feeling that a Naval Reserve man was a very good sort of fellow, but still he was a "mercantile man," but I venture to say that in this country at any rate, the sooner the hand is joined between the Royal Navy and the mercantile marine, without the slightest distinction, the better it will be for the country. The lecturer has also touched upon the subject of the Royal Naval Reserve, in connec-

¹ They embarked in batches of 200 for twenty-eight days' drill.

² On joining the Fleet at Portland some 500 or 600 of the Royal Naval Reserve were sent from us to other ships for the cruise, and returned to us when it was over.

tion with the Admiralty, and I think it must be patent to every gentleman here present that it is absolutely absurd that a Naval Reserve Force, instead of being in touch with its head and its commander, the Admiralty, should have to go through a trade department, the Board of Trade, simply, I presume, because there is some official at the Board of Trade who is supposed to be the guardian angel of merchant seamen—a sort of Assistant Registrar-General. What is the fact? Why, that every Reserve Officer who wishes to communicate with the Admiralty is bound to do so through the Board of Trade; the Board of Trade is entitled to read the letter to see what he says, and to forward it on or not, as they think proper. He has no direct communication with the Admiralty, he has no right to appeal, and if he makes matters a little too hot he may fear lest he be imperilling his certificate or his general comfort in the mercantile marine. I think the two Services, viz., under Board of Trade certificate and under Admiralty Commission, should be completely cut asunder, so that if a man is willing to serve his country in the Reserve, his private occupation with regard to serving merchant-owners, under certain statutes, should not be allowed to have any connection or touch whatever with his public service to the State. Then we have touched upon the question of commerce going under a neutral flag in time of war. That of course depends, as the lecturer has put it, upon whether certain international law is going to be kept to as law in war-time: and I have not the slightest doubt myself that, as soon as we have a general European war, all those little details of the international pledges—apart from the Law of Nations—those pretty little things that certain professors get up in time of peace, will be swept away, and that the enemy's goods, when we are the enemy, will be considered capturable wherever they are get-at-able. I very much doubt whether our goods will be allowed to go untouched under a neutral flag. What will be the result? We must have fast steamers to bring our food; we cannot trust to a neutral flag at all events, we must have fast steamers, and we must have the men to man them. At the present moment the lecturer has put down that there are 15 per cent. of foreigners serving in our ships; I should think that it is more like 25 per cent. I do not know whether I am right. I have seen the statistics to a certain extent, but I am inclined to believe that it is as much as that, for this reason,—that there are in almost every merchant ship a large number of men who call themselves Englishmen who are really nothing but Swedes, Turks, Norwegians, Maltese, speaking English, many of them holding English certificates; they are entitled to go to the Board of Trade for examination, and to go to a merchant and say, "Look here, I will take half the price that your thundering Englishman will take, ship me as mate;" and he goes on board, bullies the men and drives them about. That is what makes our mercantile marine, in the smaller ships, distasteful to young Englishmen, who would otherwise make first-class Officers. They make one or two voyages, and then chuck the thing up, and go into a shore-going line. If we could only get the country to see the danger we are in in not keeping up the supply of seamen and Officers which may eventually be drafted into the Navy, it would be a very good thing. The difficulty is to get the country to see it. It is easy enough to see that each British ship shall carry so many per cent. of Englishmen, or so many per ton, and then merchants will not find it pay to carry foreigners, and we shall have an industry opening for our British seamen to go into, and make a profession of it and carry it on. There was one question as to the capture of fast steamers. Now, of course, the naval manœuvres last year were very good for the country, but I cannot think that any seaman or expert would say that those captures which were made represent in the slightest degree anything that would take place in the time of war. These merchant ships were unaware that the cruisers were about. They did not care for capture, their only business was to carry out the owner's orders, to get to port in the usual course, and they did not even take the trouble to run away. Of course it is easy to see that if a foreign cruiser were on the station and she had to chase one of these ships all day, and another ship the next day, and another the next, by that time she would have precious little coal left, and she would have to go away for her own safety without molesting any more ships. With regard to the question why the ranks of the Royal Naval Reserve are not filled up, the fact is simply this, that men who have served for twenty, thirty, or forty years

at sea do not care to take subalterns' positions. They do not in these days get a Lieutenant's commission without having served as Sub-Lieutenant; and even if they get a Lieutenant's commission it is not very much. There are many opportunities in war in which, at least, Officers of the rank of Commander could be used, and when you get sufficient rank given to a man he may say, "Well, it is worth my while for the greater rank to go into this Service." I think it has been treated rather too much on the idea that a man would jump at it simply because he would have the privilege of wearing a sword and a cocked hat. That is not the way in which the Royal Naval Reserve Officers look at the matter. If they serve in the Reserve at all, they do it as a national public duty, because their life has been spent at sea, their instincts are in the sea, and many of them have that nasty roaming spirit which used to make pirates and privateers; an instinct that if there is a row they hope to be in it, but in the Navy. That is the national spirit which has made us the maritime nation that we have been, and that I hope we are still going to be. If the country would only see it in that light, and make the Reserve more comfortable to the Officers and to the men, give them more cruising instead of relegating them to fourteen days in a drill-ship, which is very much like putting men into a prison-yard where they cannot move, some good would be done. The men do not get drill enough, they do not get discipline enough; you allow them to be trained under a seaman gunner. What you want is a smart Gunnery Lieutenant to hurry them round and show them their drill and duties properly, and then they will not be ashamed to go on board a man-of-war and show what they can do. There is only one other thing which I will touch upon, and that is that as the Naval Artillery Volunteers have been mentioned, I think I shall not be departing from the strict order of this lecture if I here say that the Naval Reserve must be kept entirely separate from any idea of a local Volunteer force, it must be a national force. The Naval Reserve must be a national force capable and liable to serve with the Fleet wherever it may be. The Naval Volunteer is also a force national, not local, and under the Act is liable to serve in the British Fleet around the home waters. There has been a movement lately going on throughout the country, going to different ports and asking them to raise Naval Volunteers, to man, and arm, and fit out tug-boats and barges for the local defence. That is a very good move, if the local people like to do it, but I venture to say it ought to have nothing to do with the Royal Naval Reserve, nor with the Naval Volunteers, because it is in effect placing a naval force under the orders of the Mayor or the police of the township; whereas the entire force ought to be, and must be, under the orders of the Admiral on the station, and at his direct beck and call. So that if we have vessels fitted out for them to work in, those vessels must not be simply the property of one port and thus not available to go to another; they must be ready to go wherever the Admiral on the station may say that they are wanted. I think that a great difficulty, and a very grave difficulty, will arise in war-time if private individuals were allowed to fit, man, and arm vessels at certain places for their own defence. They would immediately demur to those defences being taken away simply because the Admiral on the station said, "Why, here is Aberdeen threatened, you people from the Forth must send your gunboats and torpedoes up to Aberdeen." Naturally the private individuals would say, "Our private property shall not go from the Forth." That would bring chaos, and it ought not to be mixed up with any Naval Reserve scheme in this country.

The CHAIRMAN: This has been a very interesting lecture. There has been a great deal to be learnt from it, but there is, undoubtedly, a great deal of misapprehension existing. If you look at the thing patiently you will see that the great objection to the old Coast Volunteer was the personification of other people—another person coming and claiming the fee, giving a wrong name, and cheating the Crown. The great object of establishing the Royal Naval Reserve was to have the means of identifying the Naval Reserve men. The Board of Trade are bound by Act of Parliament, when men are discharged and when men are entered, as far as possible, to ascertain where they live, their national domicile, and to be ready to give them advice, as shipping-masters, if they should ask for it. Therefore the natural course, when you are establishing a Reserve from the mercantile marine, is to go to the Board of Trade and to ascertain from it who these men are, and whether they are

available. Now, the Naval Reserve is in much more touch with the Admiralty than many of the speakers have thought. Every week—every month certainly—constantly, every week, the name of every single Naval Reserve man available in the United Kingdom is laid on the desk of the Admiralty Superintendent of Naval Reserve, who is responsible to the Admiralty for them. The Admiralty know exactly, to a man, the number of men who could be brought from the Naval Reserve, and in twenty-four hours they could send to them. They know who are employed at home and who are employed abroad; and it would be impossible to do that without the machinery of the Board of Trade—and very effectively does the Board of Trade, on the whole, do that work. It is a marvellous thing, and rather a humiliating thing, that, as a matter of fact, we have in the Royal Naval Reserve the cream of the men of all the merchant steamers. I do not suppose there are in the kingdom 4,000 more able seamen available than we have now in the Royal Naval Reserve. These things are so remarkable that, until the facts were put before us, it was perfectly incredible. As a matter of fact the number of sailors discharged before they even complete their voyage is 49,000 yearly! What with desertion—what with imprisonment—what with sickness—what with those who die and those who are discharged, there are, in point of fact, 49,000 men in trade in this country whom you may assume you would not like to have to trust upon in a Naval Reserve from different causes; they get disgusted with their ship—some get into scrapes—some are away—some are helpless. Then the number of people rejected by the Medical Officers of the Royal Naval Reserve is very considerable; it is about 6 per cent. The number of foreigners is also very great. Some time ago it was 21,000—but the number now is 24,000, and, as has been well said by one speaker, that is only the number of those who are entered as foreigners; but there are a great many who are foreigners and half-foreigners who are not entered as foreigners, and those people would diminish the number of men available, very much. There is another item: the number of stewards and servants on board the ships, and the men who do not go aloft. The number of these men who are not trained was 30,000; and I believe now that number is very much increased. There are a great many men who enter for the trip; they do not come back, and they are not what you would consider as sailors. There is really no difficulty in filling up the numbers of the Naval Reserve if you are indifferent to quality. But here again you are confronted with a very great difficulty. The expenses of the Naval Reserve, I suppose, in rough figures, since its establishment, have been between six and seven millions sterling. For these six or seven millions no man ever yet has been called upon to serve—and there are a great many men in receipt of pension as Naval Reserve men. Therefore, in the way we have it, it is an expensive Reserve—not a bit too expensive. The number of the second-class Reserve could be increased at any one moment, probably, that you liked; but there again, among the highlands of Scotland, a great many of these people do not speak English, therefore you must leave the Reserve to enter those men whom they think most desirable. I believe we get the full worth of all our money. I do not think there is a finer body of sailors to be seen in any other country in the world than our best Naval Reserve. But for all that there is no use blinking the question. The whole number of our Reserves are totally and entirely inadequate to what we should want. When you look at the old naval histories you will see Lord Keppel, when First Lord of the Admiralty at the conclusion of the American War, even 100 years ago, announced that we had then afloat 150,000 sailors, including marines. Now we have only 9,000 first class, 8,000 second class, and 2,000 Volunteers; but they give the country the nucleus of a most valuable body of men—they do give the country sufficient to say that if there should be war to-morrow we can man every ship in every port. It is quite true there is a considerable want of provision for war in the Navy. No doubt four or five years ago we had not ships enough which we could have got ready to have escorted our home-bound fleets and to protect our shores. Gradually and steadily the numbers are increasing, and we shall want as many men as we ever did before. Look at the enormous wealth of this country; and to suppose that our coast can be protected without a fleet of gunboats to keep it from privateers is to suppose that really the dread of your name is to last for ever; that is my view of it. I think that we all are much obliged to the lecturer for his admirable paper, and I am sure there is nothing I have said that was meant to diminish the value of his paper.

Lieutenant CABORNE: Captain Curtis said he presumed that I referred to merchants and ship-owners when alluding to patriotism.

Captain CURTIS: To people generally; not to our own fishermen.

Lieutenant CABORNE: It was a general remark. The engineers of the Naval Reserve are, as Admiral Colomb said, practical and capable men, but it would be a very great advantage indeed if they were permitted to serve for a time in the Royal Navy, as, in addition to becoming acquainted with the leading features of naval routine and discipline, they would learn a good deal about torpedoes, hydraulic machinery for turrets and guns, &c. The stokers of the Royal Navy are taught gunnery and rifle exercises, and although from a naval point of view it might not be considered necessary that the same instruction should be afforded to the stoker section of the Reserve, yet the habits of discipline which the men would acquire while undergoing drill would be very beneficial. My own experience has been that the mercantile marine stokers, as a rule, give more trouble than do the sailors. In reply to Commander McLaughlin, I can only give my personal experience, and mention that during the twelve months I served in the Fleet I performed precisely the same duties, and was treated in exactly the same manner, as the Lieutenants of the Royal Navy. I may add that I have a very pleasant recollection of the cordiality and kindness which I invariably received at the hands of all ranks in the Service. The main object of the Reserve Officers serving in the Fleet for twelve months is to enable them to become acquainted with the general routine of a man-of-war, and in the time named they can, I think, pick up all that is requisite. Gunnery and field exercises can be better learned by going through a course in the "Excellent." Referring to the subject of foreigners in the merchant service, I beg to state that I took my figures from the official Returns, but it is quite possible that the real number greatly exceeds the 15 per cent. given. It is true that the ranks of the Naval Reserve are almost filled up to the number sanctioned by the Admiralty and the Treasury, but I consider that the strength allowed is insufficient and should be increased. Apparently, Lieutenant Baden-Powell is not aware that, upon complying with certain conditions, Officers of the mercantile marine can now join the Naval Reserve with the rank of Lieutenant. I cannot say that I am altogether in favour of this rule. In fact I think that some of the regulations for Officers of the Royal Naval Reserve require revision. Unless the men of the Naval Reserve are drilled with modern weapons they cannot be expected to be efficient when called upon to serve afloat. I imagine that the vessels upon which they will be embarked for service will be principally armed with quick-firing, machine, and 4-, 5-, or 6-inch B.L. guns, and it is instruction in the use of these weapons that I now advocate. I should like to see Gunnery Lieutenants appointed to the "President" and the "Eagle," for many reasons; some of those reasons I need not enter into now. However, I may say that there are many of our Officers who possess very little knowledge of naval customs and etiquette, and if they had a young Gunnery Lieutenant to mix with them, to superintend their drills, and to instruct them generally, very satisfactory results would accrue. Our Chairman (Sir Augustus Phillimore) appears to think that it is absolutely necessary that the Board of Trade and the Registrar-General of Shipping and Seamen should deal with the Naval Reserve. At first it was so. Men would not have joined the force had it been placed directly under the Admiralty, as they were afraid of being entrapped into the Navy. That was one reason. Then again no one else knew anything about the merchant seamen and how they were to be got at. All that is now changed. I admit that at the present moment you cannot do without the services of the Registrars of Naval Reserve; their lack of status as Board of Trade officials in connection with the force appears to have been recognized at the Admiralty, and many of those gentlemen have been granted honorary commissions as Paymasters and Assistant-Paymasters. It is impossible on this occasion to discuss the manner in which the very desirable change should be effected—there is no real difficulty—but I know that the Naval Reserve could and might be brought directly under the Admiralty with advantage to all concerned. Even if the present system were defensible as regards the men, it would be wholly indefensible as regards the Officers. I advocated an increase in the second class, because of its cheapness. You only pay a man a retainer of 2*l.* 10*s.* a year as long as he serves, and when he is too old to serve any longer you do not give him a pension. You cannot get him cheaper than that.

Captain CURTIS: It is not enough.

Lieutenant CABORNE: There is a difficulty in attacking the Treasury.

Captain CURTIS: You cannot get the men.

Lieutenant CABORNE: I think you can get the men without difficulty if the authorities will allow the number to be increased.

Captain CURTIS: I asked a fisherman direct, and he had been in the Naval Reserve. He said he could not do it for 2*l.* 10*s.*—a man with a wife and children.

The CHAIRMAN: It is not really 2*l.* 10*s.*; it is 6*l.*, if you take the allowance for provisions and clothing. Every second-class man really gets 6*l.* a year from the Admiralty.

Lieutenant CABORNE: I think it comes to 7*l.* 12*s.*

Captain CURTIS: That is for a week because he is only to drill twenty-eight days.

The CHAIRMAN: It is 6*l.* a year for every second-class man and 10*l.* a year for every first-class man.

Lieutenant CABORNE: Then there is the suit of uniform; it is really about 7*l.* 12*s.* he receives.

Captain CURTIS: He gets 7*l.* 12*s.* for twenty-eight days and the risk of being shot.

Lieutenant CABORNE: We all incur that risk, and some of us do not get so much in proportion.

The CHAIRMAN: I do not think there is anything more to do except to express our thanks to Lieutenant Caborne. I should like to have said one word more for fear there should be any mistake about it. There is no country that is so much indebted to its merchant seamen in the past as this country. In the olden wars, when the merchant ships were laid up, the mates and masters of those merchant ships constantly found their way into the Navy as well as the men. They often entered as master's mates; they often entered in the navigating line. They became masters and pilots. They often rose to the highest ranks the Service could give. There are many names, if you go back into the past, men like Sir Cloudesley Shovel, that came in from the merchant ship. One man I knew myself, said to me, "I was a second-class boy at Shields, and I filled every rank in the Navy from side-boy to Rear-Admiral."

Note.—The Registrars of Naval Reserve receive an allowance from the Naval Estimates, a contribution towards their pensions is also made from the same source, and, as I have already stated, many of them hold Honorary Commissions in the Royal Naval Reserve. Such being the case, those officials, as regards their Naval Reserve duties, should most certainly be brought directly under the Admiralty.
—W. F. C.

Wednesday, February 6, 1889.

REAR-ADMIRAL P. H. COLOMB, Member of Council, in the Chair.

ON COALING SHIPS.

By Lieutenant T. Y. GREET, R.N.

(Read in his absence by Mr. R. A. Baillie, C.E.)

ANYBODY who witnessed the Manœuvres of 1888 must have been struck by the deplorable condition of the coaling arrangements of the Fleet. This, the most important factor in the whole science of naval warfare, appears to have been lost sight of in the great, and certainly very important items, of speed, armour, and guns. Yet what will be the use of these, if the ship cannot move for want of the means of propulsion? Take one example—there are many—the Blockading Squadron off Lough Swilly. It must be remembered that the enemy was in his own port, he could constantly replenish his bunkers. But how different the case of the Blockading Squadron: they were always on the move—which meant using coal, especially as they had to be ready at short notice to go full speed—and the consumption of these big ships is considerable; in consequence, one or more of them was always out of action, filling up with coal, so that really a fleet of ten ships can only be considered one of eight. Now, while these two ships are coaling, the remainder are steadily but surely eating away at their coal; suddenly the blockade is broken, the Blockaded Fleet shoots out well filled up with coal. The Admiral of the Blockading Fleet follows, but how far? His ships have only half their bunkers full, or perhaps some are nearly full and others nearly empty, and to his disgust he has either to give up the chase, or risk capture through going on with an inferior force; or perhaps in the excitement he forgets that coal is running short in some of the ships, and they have to be left behind to their fate, or towed by others into a port. Can anybody imagine anything more heartbreaking or more calculated to lead to disaster? Yet I think this must have been apparent to every man in the Fleet. Surely the time has now come when this all-important question should be given the attention which it merits; let speed, guns, and armour rest awhile—not a bad idea, as people appear to be getting somewhat mixed on those subjects through over-attention—and they will then be able to go back to them with redoubled vigour, their minds strengthened by change and rest.

Now, let us see some statistics on this coaling. Luckily, during

the manœuvres the weather was for the most part fine; it might be otherwise. In the first place, ships had to go some distance to a harbour; this meant coal both to get there and also to return to the Fleet, as it had to be done at a somewhat quick rate of steaming, coaling at sea under the present arrangements being almost out of the question, yet it could be done in very fine weather. Private vessels are afraid to go alongside a man-of-war, even in very ordinary weather, for fear of getting stove in; of course this is natural, but it will not do on service. The Admiralty ought to have their own colliers. The following are some of the times taken in coaling:—

"Agincourt," at Plymouth, with a large lighter on each side, fitted with derricks and steam winches and every facility, owing to her numerous ports	500 tons.	12 hours.
"Iron Duke," at Plymouth, with one lighter, but having only one hatch, consequently only able to coal in one position	330 "	22 "
"Iron Duke," at Portsmouth, a jetty on one side, and a lighter on the other, bags being already filled	55 "	2½ "

At Spithead, it was really pitiful to see a lighter with two small derricks coaling a ship, one bag going up at a time. The above are the arrangements at the two principal Naval Arsenals in the Kingdom.

Now, from colliers at Lamlash, which may be taken as an example of what would go on in war-time, and which had two hatches and two steam winches—

The "Agincourt" took in.....	187 tons.	9 hours.
The "Shannon" "	146 "	12 "
The "Iron Duke" "	167 "	9½ "
The "Tartar" "	53 "	6 "
The "Neptune" "	250 "	10 "
The "Inflexible" "	227 "	12 "
The "Inconstant" "	197 "	13½ "

At Sheep Haven, in a heavy swell, and coaling all night in pouring rain from a collier—

The "Iron Duke" took in.....	116 tons.	9½ hours.
The "Iron Duke" took in, at Lockandaile	220 "	9 "

In the Downs from horse-boats carrying about 12 tons, which had to be hauled to and from the collier to the ship, and using cutters for towing, bags being filled by men from ship:—

The "Iron Duke" took in.....	97 tons.	12 hours.
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The following gives some idea of what is at present considered smart work in coaling:—One Commander signals to another, "375 tons in 19 hours, what do you think of it?" Yet considering that ships carry 1,000 tons as a rule, this would mean a ship being out of action for nearly three days; and one has to consider what would be the result to the men? They come away from a blockade harassed and worn out by the anxiety of night and day look-out and constant attack by torpedo-boats, to have three days of utter discomfort and

extreme hard work, which I venture to say would swell the sick list to an alarming extent, and so tend to cripple the fighting capabilities of the ship, as every man is a fighting factor.

Now, from the foregoing, it is evident that what is required is that a ship should be able to take in her coal on her station in the blockade, and at a very quick rate; also that she should constantly replenish, and so be ready for any contingency. There is a great advantage in filling up frequently before too much is used; if necessary a portion, according to deck space, can be left on deck more conveniently and stowed at leisure, as everybody knows it is the last part of coaling that takes so long on account of the stowage. This leads us to another matter which greatly needs alteration, that is the present shape and position of the bunkers and the means of filling them. It would appear as if when the ship is designed everything has its place allotted, after which the remaining space, mostly holes and corners, is designated "coals:" therein lies a great cause of delay. Why not make the bunkers of plain shape; wing bunkers round the engines and boilers, and plain boxes going right across the ship before and abaft the boilers? These would dispense with the numerous holes in the deck, and their shoots, also with having to move the coal about the deck to them from where it comes in. Then instead have a trunk or shaft of convenient size cut in the deck fitted with a sufficiently strong hatch of iron, and from this, shoots at an *angle* to carry the coal to all parts of the bunkers; if any trimming is required these shoots can be cut off by dropping a shutter in them.

Let us refer to the various methods now in use at the different yards.

It seems strange that the coaling arrangements at present are practically the same as they were when steam was first introduced into the Navy, although the subject has been several times discussed in this Institution. The only difference that I can see in the last twenty-one years is that we have borrowed from abroad the system of coaling with baskets, this only at the western port; and canvas buckets holding about 78 lbs. are now on trial. Of course the cheapness of native labour renders coaling abroad quicker on account of the number of men that can be employed, and these men do little or nothing else; but this description of labour makes them, being barefooted and having little clothing to hamper them in their movements, adepts at it.

At the western port, alongside the dockyard, the coaling is done by means of carts (carrying about a ton each load) which bring the coal from the shed and shoot it alongside the ship; it is then passed in through the ports by means of baskets holding about 100 lbs. each.

By these means 600 tons are taken in in 15½ hours. Here it depends upon the rapidity of the carting, the endurance and the smartness of the manual labour.

For coaling in the Sound, hulks are fitted with derricks and steam winches; some of these only have one hatchway, consequently, most of the older ironclads and vessels can only coal from one position at a time, which is a great source of delay; this is especially the case with vessels having a battery, and, consequently, few ports. The coal

in these hulks is in bulk, and is got on board in bags, which have to be filled by men from the ship coaling.

At Portland, the bags are first filled at the coal wharf by men from the ship coaling, they are got into lighters fitted with no appliances, and then hoisted on board. This is a very tedious process.

At Portsmouth, the coal bags are generally ready filled at the wharf, and the lighters also are loaded with them, whence they are hoisted in by the ship's appliances.

The system of loading by baskets is certainly by far the best at present; it is a question whether the smaller baskets used abroad are not better, especially if they were supplied for coaling from lighters, which is not the case at present. At Sydney, Cape Breton Island, vessels go alongside a wharf, down which trucks are run, and their contents, about $4\frac{1}{2}$ tons, are shot on to the deck of the ship.

The system advocated in this paper certainly has the following advantages over any other at present adopted, viz.: (a) Is quicker, (b) much cheaper, (c) more efficient.

(a) It is quicker, because a continuous stream of coal is always pouring into the bunkers, and there is no delay hooking on bags or filling them, nor cause for desire to "stand easy" among the men, few of whom would be required, which would be a great advantage in war-time.

(b) Cheaper, owing to saving in the cost of coal bags, which quickly wear out, and many of which are lost overboard. It would save transshipment (at present transshipment occurs twice) if colliers are used instead of the hulks as at present, and cost of hulks' crews will be saved. If there were two of these colliers of about 1,000 tons each at each port, one of which could always be loading while the other was at Spithead or in the Sound supplying the fleet, and a wharf with tipping-trucks for the harbour, coaling would not be the lengthy operation it is at present. This, I submit, would be a great saving to the Admiralty.

I am not quite certain about my figures, but am not far wrong. Welsh coal costs 7s. per ton at the pit's mouth, and north country coal 5s. Freight to Plymouth is about 4s. 3d., and to Portsmouth per ton 4s. 6d.; these are low prices. The transshipment from collier to yard or lighter, roughly, 1s. 2d. per ton; this makes the cost per ton to the shipper, taking the average, about 11s. 6d. The rate-book says the contract price is 15s. 2d.; perhaps the Admiralty put something on for maintenance of hulks, cost of bags, general wear and tear, &c.; but I think the Admiralty might save at least 5s. per ton by having their own colliers fitted in the method below described, and have far greater efficiency; in time of war it would be almost imperative that they should have their own vessels, of whatever description used, for the reason I have before mentioned, and because merchant captains at present are afraid to go alongside a man-of-war, and there are other reasons which will occur to all Naval Officers. These vessels could be classed in the same category as the yard craft, and the saving in the expense of coal would soon pay for the building of vessels. In the case of transshipment to the harbour depôt, the new collier would

discharge the coal at a much lower figure into the trucks, and at a much quicker rate.

(c.) It is more efficient because practically automatic, and not dependent on manual labour.

With regard to coaling at sea, under the same conditions of wind and weather, it would certainly have the same advantages over the present system there as it would have in port.

I think it hardly necessary to discuss the way in which the coaling is done on board a man-of-war. But suffice it to say, it is done by whips from yards, stays or derricks rigged over the ports, manual labour and steam capstan being the power employed.

The following is a description of the vessel and her appliances :—

The collier can be of any size, and fitted out as a sea-going vessel, with engines of sufficient power to insure a good speed.

The coaling apparatus is worked by steam supplied from the main boilers; this is important, because no donkey or auxiliary boilers are required. The exhaust steam from the coaling machinery is carried back to main condensers in engine-room, thus keeping the water in main boilers in good condition, as no waste is required to be made up by sea-water feed.

The coal is delivered on board the ship through telescopic iron tubes or shoots, direct into portable funnels; or the spout on the end of shoot is placed directly into the bunker hole in the deck, and the delivery is regulated by the speed of coaling machinery, and may be from 20 to 200 tons per hour, as found most convenient.

The holds are ceiled at sides and bottom with light plating to secure a smooth surface and facilitate the flow of coal to lower ends of booms.

The collier is fitted with six bulkheads. The machinery for working the cargo is fixed between the two midship bulkheads, and consists of one pair of small engines to work the coal buckets, and another pair to lift and lower the hopper and coal shoots.

Heavy wood rubbing pieces are attached on the sides and gunwale.

The forward part below deck is conveniently fitted up for berthing the crew. The after part below deck with cabins, &c., for Officers. The lavatories are placed under the bridge deck forward.

When in special cases of build, ballast is required, the ceiling in bottom of holds is made thicker, the space between ceiling and bottom forming a very convenient water-ballast chamber.

The price is of course dependent on the requirement and capacity, the larger the collier the less cost per ton.

The coaling of steamships is by this method performed very quickly, at minimum of labour and dust.

On account of the sponson ports and overhanging gear on a man-of-war's sides, the collier should carry very large fenders of about six feet in diameter; there would then be little chance of damage being done to either collier or warship. These fenders could easily be made of a suitable material giving lightness and elasticity, for instance, coir rope.

An exact position with regard to lying alongside is not necessary, as

the end of the coal shoot is quickly guyed to any particular bunker-hole where the coal is required. This is a very important feature, as it gives the men time to carefully trim the bunkers, and not interfere with the steady delivery of coal.

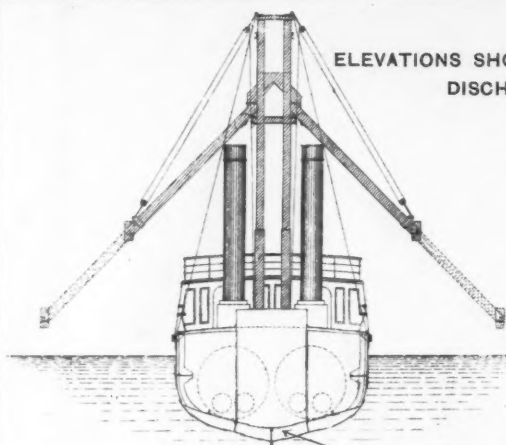
The coal is delivered into the telescopic shoot from a hopper supplied by buckets, each of one hundredweight or other suitable capacity, attached to steel endless chains, working on barrels on the ends of a light steel-plated boom. The upper ends of booms are hinged on the barrel shaft working in bearings secured to the hopper. The hopper is guided vertically by the light plated steel columns, and lifted or lowered by screws attached to under side of hopper, worked by suitable machinery placed in the centre compartment under deck. The elevation of the hopper is decided by the position and level of coal in the holds. The two operations, viz., elevating coal to the hopper, and lifting or lowering the hopper with coal shoots attached, are quite independent of each other and simultaneous, and manipulated from the same locality; when the last part of the cargo is being delivered, the hopper is at its lowest position, with the lower ends of bucket-booms at the farthest ends of the holds. At the commencement of discharging cargo, the traveller-wheels on lower end of booms are resting on the surface of the coal. As the cargo is being discharged, the booms gradually radiate to the position tinted blue, the traveller wheels resting on the bottom ceiling plating, then by lowering the hopper the ends of the booms travel to the extreme limits of the holds. The operations of elevating the coal to the hopper, of lowering or lifting the hopper with coal shoots are entirely in the hands of the engineer, and made at intervals or continuous as may be convenient.

When making the voyage the apparatus is lowered to the position shown, the light steel-plated columns being telescopic, the coal shoots are turned fore and aft, the whole occupying the small central deck space shown on plan. The whole apparatus then offers very little surface to the wind.

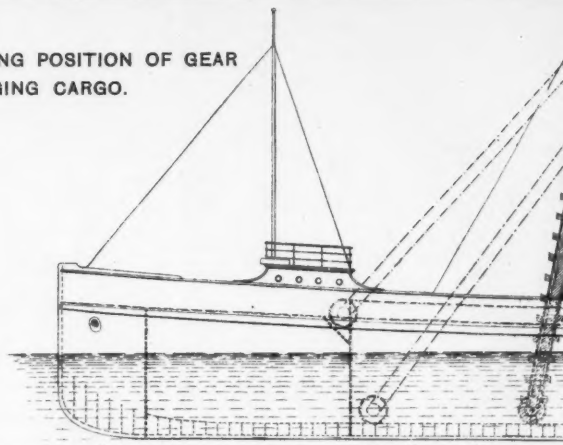
When bunker-holes are inaccessible to ends of coal-shoots, the delivery is directed in portable tubes or trolleys, and tipped at a convenient bunker-hole. These trolleys form part of the collier's gear, are made light, and readily lifted on board. The portable funnels before mentioned are also part of her gear. Thus the collier is adapted and fitted for coaling any ship.

Men-of-war can also use their collision mats rolled to form a fender. By these means, and with slight way on, the hawser from the collier to the ship being made fast on the inner bow of the former, in order to allow a stream of water to pass between the two, coaling at sea from a collier as described above would not be a very formidable operation, and in harbour would apparently meet all requirements.

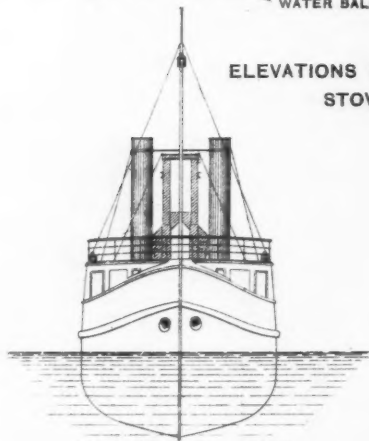
A single apparatus can be applied easily to an ordinary collier, where the machinery can either be placed below by building a bulk-head, or on deck like an ordinary donkey engine. Supposing the vessel has two holds, one can be placed at each of them, and each apparatus can be made to discharge 100 tons an hour.



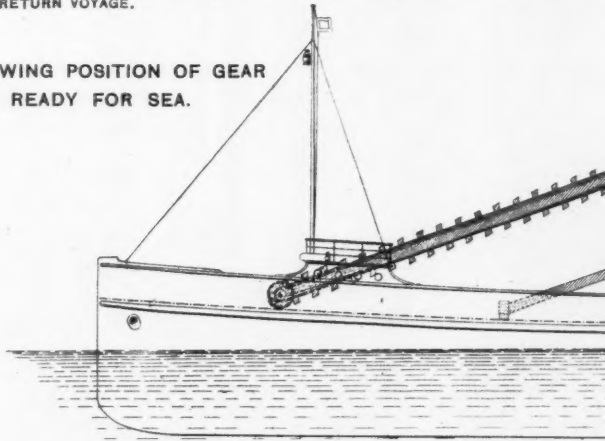
ELEVATIONS SHOWING POSITION OF GEAR
DISCHARGING CARGO.



WATER BALLAST. RETURN VOYAGE.



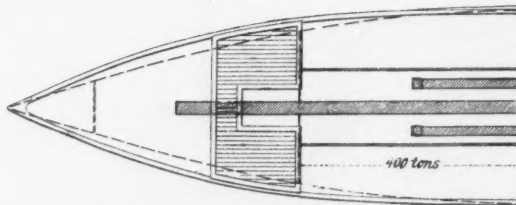
ELEVATIONS SHOWING POSITION OF GEAR
STOWED READY FOR SEA.



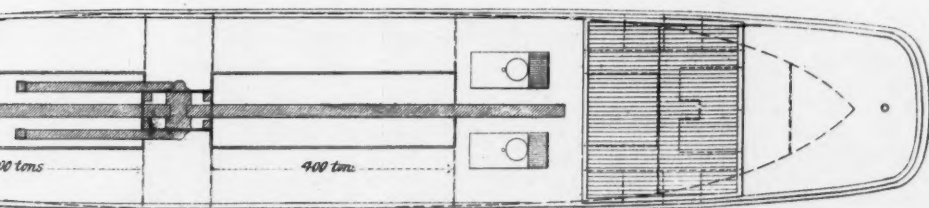
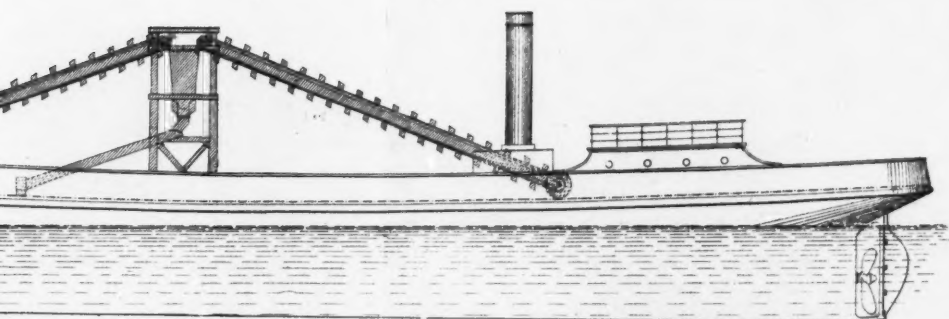
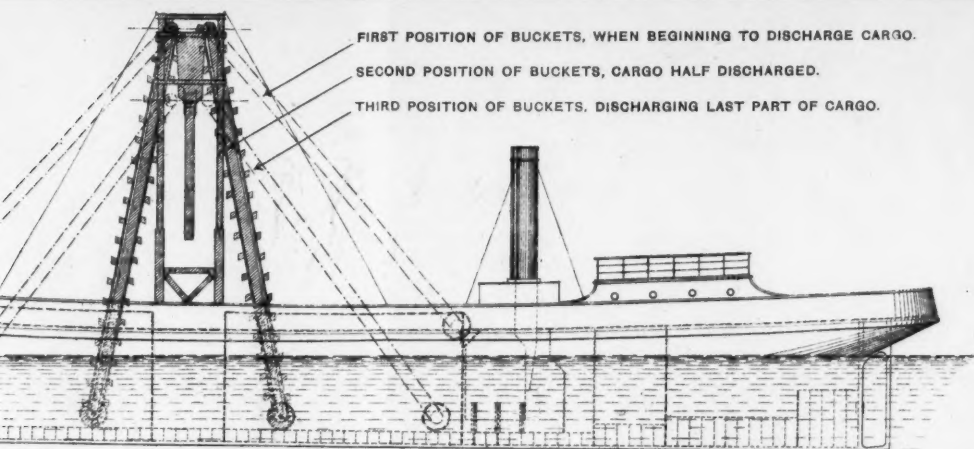
800 TON COALING FLOAT.

BLUE FOR COALING GEAR, SHOWN THUS.....

RED



PLAN SHOWING SPACE OCC



SPACE OCCUPIED ON DECK BY COALING GEAR WHEN AT SEA.

Mr. JAMES RIGGS, C.E. : I should have preferred that some one else had been called upon before myself to take part in this discussion, and I will endeavour to be as brief as possible. My business is that of an engineer, and, in connection with this question of loading coal, I have been at work now more than twenty years. In the year 1882 the difficulty of coaling steamers was brought before me very prominently by a firm of shipowners in Liverpool, and I was led to take out a patent for a method of doing almost exactly what this steam collier is intended to accomplish. With regard to the drawings which are before us, I cannot help thinking that they are open to criticism, and that they are here for that purpose; and, among other matters which it seems to me may be criticized and condemned more particularly is the bucket, which I consider would be impracticable. Buckets are not suitable for loading coal, and that preferred in the Navy cannot be put into buckets at all, because it is South Wales coal, and is in far larger blocks than that obtained in Lancashire and the North. The coal to be dealt with would require trays and not buckets such as these. In my specification I have made a difference between *buckets*, which were a success for loading grain, and the *trays*, which we intended to use under similar circumstances to those now under discussion. I understand the booms travel along the coal. If they are not protected in their travel *from* the coal I do not think it possible satisfactorily to work the machinery which we are informed is placed amidships for raising and lowering the columns to which these booms are attached. There are other matters of detail which, I think, are open to criticism, but the object intended to be attained is a very admirable one, and I think, subject to these criticisms, this could be made perfectly practicable as a collier for coaling a man-of-war at sea. There are, however, other occasions when these, as well as other vessels, have to be coaled, and I venture to think they are as important, if not more so, than coaling at sea. There are coaling stations of three kinds. In the first place, those in which coal is loaded from railway trucks at a considerable elevation. Secondly, there are stations such as that of the Tanjong Pagar Dock Company at Singapore, where they take coal out in cargoes, stow it in sheds, and that coal is subsequently put on board the steamers by means of a large staff of coolies, the whole of the coal being carried on these men's shoulders. Thirdly, the most important description of coaling station is such as that of the Grand Canary Coaling Company, where the coal must be loaded out in the open, just as grain is also landed at Taganrog. These three cases have to be dealt with, and I think each of them is quite as important as the one which is the exact subject under consideration. As it is of interest I will just add, with regard to this patent of my own for a floating elevator, of which here are the drawings, that I found, on taking it out in 1882, that the cost of coaling, as compared with manual labour in Liverpool, would be as follows. The calculation from which I quote formed part of a descriptive article respecting my system which appeared in "Engineering" at that time:—

"Cost of Bunkering Coal with Patent Elevator.

	£	s.	d.	s.	d.
Engineer, per week.	2	0	0		
Stoker	1	7	0		
Additional labour (two men).....	2	10	0		
	<hr/>				
	5	17	0		
Depreciation 10 per cent. on cost of elevator (2,500 <i>l.</i>) for one week	4	16	2		
Coal and stores per week (three working days)....	3	5	0		
Filling.—Eight men, each 7 tons per hour = 56 tons per hour or 560 tons in 10 hours (1 day) = 1,680 tons in 3 days at 1½ <i>d.</i> per ton.....	8	15	0		
Trimming 1,680 tons in bunkers at 2½ <i>d.</i>	17	10	0		
Royalty on 1,680 tons at 0½ <i>d.</i>	3	10	0		
	<hr/>				
	43	13	2	per ton.	
Present charge is 1,680 at 1 <i>s.</i> 6 <i>d.</i>	126	0	0	=	0 6½
	<hr/>				
	82	6	10	=	0 11¼"

Now, the buckets must be filled by hand, and I venture to assert, without fear of contradiction, that it is utterly impossible to load coal in the manner shown by these buckets. It can never be taken up by such buckets, but must be put in by hand, and the price which is now being paid, or was then paid, was 14d. a ton for that labour. The best gangs of coal stavedores were found to be capable of lifting, each man, seven tons of coal in sixty minutes; therefore, eight men, being a gang capable of working at these elevators, each lifting seven tons per hour, would result as shown in 1,680 tons being loaded in three days at 14d., or 8l. 15s. for this labour.

Captain FITZGERALD: How high will they lift it?

Mr. RIGG: Merely within a man's reach into the buckets. To this were added trimming and royalty, thus resulting in the cost shown of 64d. per ton. The charge then being made by stavedores was 1s. 6d.; therefore there was an economy of 114d. by adopting this mechanical method of loading as distinguished from the system of loading by manual labour, if it may be called a system at all; so that there is a loss of 1s. per ton on that account. I will not trouble you with more detail than this, because I feel my time ought properly to be limited, but I may mention that I have within the last six months completed, at the request of the President of La Société Française des Houillères du Nèveri, the drawings and specifications for the machinery, and it is now being built in France, of an elevator which is to be erected at Venezuela for this precise purpose of coaling steamers, but steamers which can be brought alongside. There are about ten drawings here and twenty sheets of specifications in connection with it. The first drawing gives a side elevation of this portable elevator for loading into side bunkers on both sides of a steamer simultaneously.

The CHAIRMAN: I do not want to interrupt you, but I am a little struck by the fact that we must not get away from the discussion of this particular paper to another. Probably we shall be very glad to hear the details from you on a proper occasion, but your remarks are too far away, if I may say so.

Mr. RIGG: The question of side bunkers was raised as an incident in the paper. Here are side bunkers as shown in the sectional drawing provided by the French Transatlantic Mail Steamship Company. The whole of the work is done by one pair of winding engines and by one man, and the expense is found to be very much less than that of manual labour. I am perfectly satisfied that a mechanical method of loading coal will have to be adopted before long. I might add one word to what I said just now. A question has been raised as to whether the elevator described in the paper has been tried. I understand it has not; but with regard to this one of my own, I spent the summer of 1883 with it on the Black Sea. We loaded under test at the rate of about 160 tons per hour, and I employed with it only a pair of 7-inch steam-engines. I believe this is the largest quantity that has ever been turned over within that time. The elevator with its pontoons weighed about 70 tons.

Captain FITZGERALD: I do not propose to follow the last speaker through his explanation of his drawings: I would rather confine myself to the paper which has been read. I cannot believe, in the first place, that the continuous action which, if I understand it aright, is supposed to take place with these buckets, like an ordinary dredger, would work in the way supposed. I think something of the kind might be devised in which you could fill the buckets by hand. There would be very little manual labour in shovelling the coal down hill into the buckets and working the hoist intermittently, so to speak, elevating the coal, and getting it a good height, so that it will run down into the bunkers; but as to this continuous working with the closed shoots, when I hear that it has never been tried, I am very much inclined to look at it with considerable scepticism. I think the shoots would be almost certain to choke in a very short time, and those closed shoots choked would stop work altogether. I understand it is not intended to be used for coaling at sea. The last speaker alluded to that, but I should think any seaman who saw that arrangement coming alongside at sea would ask them to haul off, and would rather chance bags or any other method, because the whole thing is too gimcrack for use at sea. There is one point to be considered in this coaling question (of course the Officer who read this paper is considering a man-of-war, and not a merchant

ship, like the last speaker). We are considering the coaling of a man-of-war, but as a matter of fact the coal is put on the deck of a man-of-war faster than it is wanted in many cases. It is a question of stowage. Generally after the first hundred tons or two are on board there is no use shooting coal on the deck. In the modern ships there is no deck to shoot it on to as a rule. The writer says there is a great advantage in filling up frequently before too much coal is used. So there would be if you could get it in; but in the way our men-of-war are built now, in a great many cases you cannot get the coal in till about one-third of it is out. It does not run down your bunkers. You may burn 100 tons of coal, and you may say "coal ship," but you cannot do it. From the shape of the bunkers the coal won't go down; it does not run away from the top, therefore you cannot fill up constantly. Then there is another question. The writer suggests, "Why not make the bunkers of plain shape; wing bunkers round the engines and boilers, and plain boxes going right across the ship, before and abaft the boilers?" I should like to see what the naval architect has to say to that. The writer evidently does not remember that our coal is our armour in modern ships. They have taken away our armour, and we are to trust to the coal for protection, and so far from plain bunkers running across the ship, one of the principal things we are to trust to for armour to keep the ship from being sunk, or the engines being smashed, is coal stowed in all sorts of in and out complicated places. You have to deal with the fact that the bunkers are not as you would like them to be. As we hear that this ingenious machine has not been tried, I think we are justified in saying try it before asking us to accept it, and I am very much afraid it will be found to be utterly unpractical.

MR. JOHN COLLETT: I should like to make a few remarks on one point. The lecturer tells us that with two colliers for each dockyard, carrying about 1,000 tons of coal each, there would be a saving by his system of 5s. a ton on the present method of supply. It is not quite clear to my mind how that is arrived at, but the greater part of it is apparently obtained by deducting the cost of the coal at Portsmouth, estimated at 11s. 6d. a ton, from the alleged rate-book price. So far from any saving being effected, I am prepared to contend that the cost would be considerably more than at present. Descending to details, the cost quoted of Welsh coal at the pit's mouth, the freight to Portsmouth, and of discharging, may be taken as fairly accurate, assuming, as appears to be the case, that the data are those of about twelve months ago; but there is an error of addition, which makes the total 12s. 6d., and not 11s. 6d. per ton. One element, however, that of transhipment from the collier to the yard, is usually included in the freight, and may be taken in diminution. On the other hand, the cost of transfer of coal from the pit's mouth to the docks at Cardiff, which is, roughly speaking, about 1s. 6d. a ton, is omitted. The data given, corrected in the way I have suggested, will make the estimate 13s., not 11s. 6d., a ton. Again, the contract price, alleged to be derived from the rate-book, is taken at 15s. 2d. per ton; as a matter of fact, the average of rate book price was 12s. 3d. last year, the price at Portsmouth being even under 12s. I think that these facts show that the greater part of the alleged saving disappears at once. Certainly there would be a small saving in the number of coal bags used, and in wear and tear of the hulks, &c., but it would not amount to much. It is stated further that two colliers would be required at each port, or for the four principal ports alone, eight in all. To compare this system financially with the present system, you must employ these colliers continually, so as to bring the freight down to what you pay to the merchant colliers at present, assuming that the Admiralty colliers are worked as cheaply. But two colliers of 1,000 tons each, running continuously, taking the average voyage at 10 days, viz., 1½ day going, 1½ day coming back, 2 days loading, and 2 discharging, and a margin of 3 days for the run, which is a moderate allowance, would considerably more than meet the requirements of the whole of the yards. You therefore have too many colliers for ordinary purposes, and, on the other hand, you have too few for quick supply. When wanted—for in time of war or any other emergency what would be the use of two, or even eight, colliers?—you would want a large fleet of them, not only for supplying the home yards, but all the squadrons round the coast. It would be impossible, I consider, for the Admiralty, with any regard for economy, to keep always in reserve a huge fleet of colliers equipped in this manner. Supposing the mechanical plan

advocated were practicable, the only feasible way to give effect to it would be to subsidize colliers to keep the apparatus on board; but this would also mean a large annual expense. In conclusion, I must confess that I do not see, even if the price of coal under both plans be taken as the same, and I have shown that the actual price is less than that estimated, how you can escape a very much larger cost under Lieutenant Greet's plan than the present system involves.

Captain CHASE PARR, R.N.: The last speaker has shown that the expense of maintaining these colliers constantly in use would be considerable, and keeping that gear fitted would also lead to considerable expense; but I do not see why colliers should not be provided with simple whips and derricks in the same way the colliers at Sydney are fitted, which bring the coal round from Newcastle and put it on board the men-of-war in the harbour of Sydney over the upper works of the highest man-of-war at a very much quicker rate than it can possibly be stowed in the bunkers. Of course for the first couple of hours perhaps the run of coal is not as fast as it can be stowed in the bunkers, but after that for the last two or three hours the delay in the stowing is so great that a very much slower supply of coal is all that is needed, and I think for war-time all that would be needed would be that a certain number of colliers should be provided with this very simple whip and derrick apparatus, and that that would meet all the requirements of the case. These vessels ought not to be too large.

The CHAIRMAN (Admiral Colomb): It is usual for the Chairman to say a word or two before calling upon the lecturer to answer the criticisms that have been offered. I think, small though we are in number, the discussion has been distinctly useful, and a great deal of light has been thrown upon the question from one or two points of view. I understood the paper myself to be founded almost actually upon the experience of the last year's manoeuvres—I took that from what is said at the beginning of the paper—and that the intention was to remove those difficulties and not to go further into the question. I do not know what was in the lecturer's mind, but the question during the manoeuvres, as far as it came under my notice, was that either large colliers required some much more rapid means of discharge than they possessed, or else that the colliers supplying a fleet in that way must be small and numerous. With these large colliers there was great delay after being placed alongside one ship before they could get to the next, and the whole fleet could not be coaled till this process had been gone through with each ship in succession. I rather supposed, I do not know whether I am right or not, that this arrangement was entirely with a view of removing that difficulty, and I presumed the idea was that colliers employed by the Government would be fitted in some method of this kind. I am not competent to criticize the machinery, and to say whether it would answer its purpose or not. We have this advantage, that the gentleman who is reading the paper for the lecturer is a competent man, and the firm to which he belongs is a competent firm. I think Mr. Rigg's remarks have been in that way very useful too, and that it is a great advantage for us that engineering firms are turning their attention to this question, which every naval Officer knows is a very important one and wants to see solved in some way. The question before us to-day, as I understand it, has not been the sea part of the business, but the coaling in harbour, and especially the coaling of fleets in harbour under pressure of war and away from regular naval bases, making attacks upon the enemy's coast and that sort of thing; or blockading where you have not your home appliances ready, and where those appliances must appear in the ships attached to the fleet for the purpose of coaling them. I will now call upon the gentleman who read the paper to answer the criticisms which have been made upon it.

Mr. BAILLIE: With reference to the cost of coal, I took the average cost of Welsh coal and north country coal at Portsmouth and Plymouth, and I think on running it out, it came more exactly at 11s. 6½d. I could not be certain about the contract price being 15s. 2d.; they are Lieutenant Greet's figures. Mr. Collett would know the exact present contract price. As to the bunkers, I think ships are at the present time being built with cross bunkers and wing bunkers along the engines and boilers.

Captain FITZGERALD: Where?

Mr. BAILLIE: In the "Camperdown," at Portsmouth. There are also the water-

ballast chambers, which, with the cabin and ward rooms along the engine and boiler space, would be use for coal in war-time.

Captain FITZGERALD: Every bunker is divided into about twenty different compartments. All I meant to imply was that the modern ships' bunkers were unfortunately more complicated than the old ones which we have hitherto had to deal with.

Mr. BAILLIE: Of course we know that the stowage and trimming of coal takes the longest time, but if there were more men available for stowing the coal, which would be the case if the coal were put on board by machinery, the trimming and stowage would be done much quicker. With reference to machinery, I may mention that the size of the engines required to elevate the coal in the present design would be two 8-inch cylinders, 16-inch stroke. The weights of the different parts of the machinery above deck would be: cross head, hopper, wheels with bearings and shafts, 3 tons 5 cwt.; the two booms with wheels at lower ends and rollers, 6 tons; shoots and nozzles, 3 tons; two sets of 40 buckets and chains, 4 tons 10 cwt. This makes a total weight of say, roughly, 17 tons. The four top columns weigh 4 tons. Working out the centre of gravity of the above, I found it was about 10 feet above deck when the whole apparatus is lowered ready for sea. The collier is designed to carry 800 tons of coal with a total displacement of 1,880 tons.

The CHAIRMAN: It only remains my pleasing duty to return your thanks to Lieutenant Greet, in his absence, for his paper, and also to Mr. Baillie for the able way in which he has read it.

Friday, February 8, 1889.

GENERAL SIR J. A. LINTORN SIMMONS, G.C.B., G.C.M.G., R.E.,
in the Chair.

THE VALUE OF ARTILLERY IN THE FIELD.

By Major-General C. H. OWEN, late R.A.

THE value of artillery in the field as a powerful instrument of destruction has been long recognized, at any rate since Napoleon, and his able artillery commanders Senarmont and Drouot, showed what better organization and increased mobility enabled them to accomplish with their guns at Friedland and in other battles.

During the long peace succeeding the Battle of Waterloo little attention was paid to artillery tactics, and in this country field artillery had been reduced to such a low point, that a few years before the Crimean War it would have been difficult to collect more than half a dozen batteries for any expedition abroad. It was only in 1848 that our troops of horse artillery were increased from two to four guns, and in 1852 both horse and field batteries were raised to six pieces, and the latter augmented to twenty batteries. This augmentation was obtained by Lord Hardinge, who had seen the great effect of artillery fire at Sobraon in 1846, and who acknowledged that "if the thirty-six heavy guns had not been brought to bear we should have been repulsed." The Russians maintained their belief in the power of artillery, and crushed the Poles at Warsaw in 1831 by the fire of a large mass of guns. They practised the same tactics on ourselves at Inkerman, bringing a mass of guns on our flank, the fire of which would doubtless have enabled their infantry to drive us from our position had they not been entangled in the ravines leading up to the heights.

The formidable power of artillery was demonstrated clearly in the Crimea, and after it very great interest was taken in all artillery matters, the fruits of which appeared in the use made by ourselves in India and China and by the French in Italy of artillery, and in the commencement of an unparalleled series of artillery experiments in this and other countries. It is true that the Prussians in the war of 1866 were much behind the other Powers in these respects, their field artillery, partly smooth-bored guns, struggled along at the rear of the other troops, they could not be brought up in sufficient numbers into action, and were not able to shoot when

there. The enormous improvements made after the war enabled it to render very great service to the other arms in 1870, and since that time there is a tendency to attribute every advance in artillery practice or tactics to Germany. Well, many of us have been told to copy the French, Germans, or others in military matters, but we are apt to forget that these have often copied ourselves, and learnt a good deal from our Schools of Instruction, our experiments, our military literature, and even from our small wars. Fortunately for us as a nation, but unfortunately for our *experience* as soldiers, our troops have never been engaged against European armies since the Crimean War, and neither Officers nor men, except a few of the former who served in the Crimea, have ever been under a heavy fire from artillery; this may account for the low estimate of field artillery now apparently held.

After all the instruction so lavishly given to British Officers of the present day, I was under the impression that the increased power of the guns now used would be recognized, and that the idea of the effect of artillery fire being chiefly moral had been exploded a good many years ago. I found, however, a short time since that I was mistaken. In an able lecture delivered at Aldershot last April by Colonel Lonsdale Hale (late R.E.), I was not a little surprised to hear him use these words: "As regards the man-killing power of artillery, I am, I know, one of a few, a very few, who believe in it;" and, when he goes on to say that this disbelief is in his opinion fraught with danger to the Army, I feel sure many of us will share his opinion. For this disbelief Colonel Hale gave the following reasons:—(1st.) That few Officers of infantry have not, in preparing for promotion examinations, imbibed their artillery ideas from Clery's "Minor Tactics," which gives instances of artillery fire practically out of date. (2nd.) Impression produced by statistics of relative effects of infantry and artillery fire given in Colonel Home's "Précis of Tactics," and Lord Wolseley's "Soldier's Pocket Book," and other works on tactics, the artillery fire being credited with only 5 per cent. of the losses against 90 due to infantry fire. (3rd.) That many artillery Officers don't believe in the man-killing power of their own weapons; and (4th, perhaps the greatest) Lord Wolseley's opinion in his "Soldier's Pocket Book" that "the effect of artillery is more moral than actual; it kills but few." I think I may safely say—that the instruction to be derived respecting the use of artillery as an arm, from some of the works on tactics generally used, is of a very meagre kind.

As for the statistics of losses, I confess to have no faith in them. Colonel Brackenbury, R.A., in his able lecture at Aldershot in June last, on the "Use and Abuse of Field Artillery," gave a long table published in the *Revue Maritime et Coloniale*, and, as he said, it has been since used by many writers. It professes to give the respective losses caused by firearms and steel in the wars of '64, '66, and '70. But we should like to know how the numbers were obtained? Whether they included killed and wounded, or only the latter, as suggested by Major Walford, R.A., in the discussion after the lecture? There are some manifest absurdities; e.g., the Prussians suffered as much from

mitrailleuse as artillery (*i.e.*, 5 per cent.); this would hardly be admitted by them: it would also appear that they had no losses from the sabre. Does this table include losses in siege as well as field operations? If so, the figures are of little value, as there were no sieges in 1866.

The Prussians by their artillery caused, according to the table of losses, 10 per cent. of the Danish losses in 1864, only 3 per cent. of Austrian losses in 1866, but 25 per cent. of French losses in 1870, showing that the effect of their fire had declined and reached a very low ebb in 1866, but had improved greatly in 1870. So far it agrees generally with the accounts given by those who took part in these wars, but it rather looks as if the table had been made to square with the accounts. Prince Kraft, speaking of the losses suffered by the large mass of artillery, 210 guns, at Vionville (Mars-la-Tour), where it was constantly within range of energetic infantry fire, says: "I have no means of knowing how large a part of the enormous losses of this artillery, in that battle, was due to artillery, and how much to infantry fire." If the table had been compiled from accurate statistics, Prince Kraft would have had the means of knowing. But he goes on to say that, as it had alone to repulse many infantry attacks, the greater part of its loss was due probably to the Chassepot fire. He makes a guess from his experience at Saint Privat, where the batteries of the Artillery of the Guard, which lost 25 per cent. of the horses and 20 per cent. of the men present in the battle, attributed 75 per cent. of this loss to Chassepot bullets. This percentage does not agree with that in the table, which gives 88 as the percentage of losses caused by French infantry fire, and this was a case most favourable to it, for, "whilst these batteries were, from 2 P.M. until nearly 6 P.M., standing in position under fire in front of Saint Privat, three French battalions, all extended in skirmishing order, lay in their front at a range of from 900 to 1,000 paces, all their men being covered by the fences between the fields. A similar line lay 100 yards in rear, and a third farther back still. The foremost of these three lines fired without ceasing at the batteries." If we take a case favourable to artillery fire, as Sedan, we find military writers, both German and French, just after the war attribute the great losses of the French especially to artillery fire; and the correspondent of the "Daily News," riding over the field the day after the action said: "The ghastly wounds inflicted on most of the French dead whom I saw upon the hill showed that they had fallen under an artillery fire; and the ground was in many places so ploughed up that a blanket could scarcely have been laid on it without covering some spot where a shell had exploded."

If I have dwelt on this table of losses longer than may seem necessary, it is because, in the discussion on Colonel Brackenbury's lecture at Aldershot on the "Use and Abuse of Artillery," it was quoted by Lord Wolseley not only to disparage the diagram of effects of shell fire shown, but to prove that "the effect of artillery is more *moral* than *actual*." He says in his "Pocket Book" (p. 389, 8th Edition): "This should be constantly pressed on the minds of you

infantry soldiers;" and he quotes at p. 121 the instance of Gravelotte, where it was said 90 per cent. of killed and wounded were hit by bullets and only 6 per cent. by artillery fire. Supposing this to be correct, it may be pointed out that at this battle the Germans attacked in some instances in columns, that Bazaine held back a fine reserve of artillery, and that the French fired common shell or ineffective shrapnel. The reason for impressing the above so-called truth, on the infantry especially, comes out at p. 121, viz.:—to "put a stop to the cry for more guns which one still hears occasionally." I am afraid this cry for more guns, as well as men and horses, will be heard pretty loudly if we find ourselves at war with a Continental nation.

If we want to form a just estimate of what artillery did as an arm in recent Continental wars, it is better, instead of trusting to doubtful tables of losses, to examine carefully the reports and accounts of those who actually served in those wars, or wrote from sound information at the time. There are plenty of such sources of information respecting the war of 1870–71 in the official accounts, and in those of Hoffbauer, Boguslawski, Rüstow, Frossard, De Wimpffen, Nieman, and others; and fortunately, as far as artillery is concerned, the subject has been exhaustively treated by Prince Kraft zu Hohenlohe Ingelfingen in his "Letters on Artillery," a good translation of which, by Lieut.-Col. Walford, R.A., is to be found in the "Proceedings of the Royal Artillery Institution" of last year.¹ You are all probably aware that Prince Kraft is considered one of the ablest artillery Officers in Europe, as far as field artillery is concerned, having had ample experience in the commands of large numbers of batteries in the wars of 1866–70, and having exerted himself most energetically during peace-time to improve the German field artillery in all its branches,—organization, drill, tactics, and gunnery. The chief results to be gathered from these "Letters on Artillery" were put forward by Colonel Brackenbury in his lecture on the "Use and Abuse of Field Artillery" at Aldershot.

Well, in all these works we may find numerous instances of a way being opened for successful attacks by other arms, of infantry and cavalry attacks being stopped or repulsed, of buildings and other obstacles being broken through or destroyed, of field artillery or machine-guns being annihilated, silenced, or driven off by the fire of artillery, and it should be needless to say that moral effect could hardly have accomplished such things without a considerable amount also of destructive effect. Although the Sepoys in the Indian Mutiny were, as Lord Wolseley said at Aldershot, inspired with confidence by hearing their own guns fire blank cartridge, I confess I don't think French, German, or our own troops would be satisfied or terrified by mere noise. The first time I was under a heavy fire from artillery a round shot came shrieking along, knocked the leader of the team of an ammunition wagon off his legs, rattled through the belly of a wheeler, and dashed on as if it had done nothing; the moral effect was certainly

¹ All quotations from Prince Kraft's letters are from this translation.

very great, and I had difficulty in getting the men to disentangle the team; it was not, however, produced by the noise but by the ghastly damage done. Those who have seen service in warfare where artillery has been employed, will, no doubt, acknowledge the great moral effect produced by its fire; and, as Colonel Brackenbury pointed out at Aldershot—"It is not the number of the enemy killed and wounded which ensures victory, but the moral effect produced on the remainder." I and a good many others think artillery may claim to inflict, beyond mere moral effect, a great deal of actual damage to men, horses, and matériel, if it be properly trained and handled well in action, but the latter is impossible if its power be not acknowledged.

To judge what can be done at the present time by artillery in the field, we must take into account the improvements made during recent years in guns and ammunition, and, what are of equal importance, the pains taken to train and instruct both Officers and men in marching, tactics, and gunnery; so that in future we shall have to deal, if engaged in a Continental war, with more formidable artilleries than that of the Germans which produced such great results in 1870. Colonel Brackenbury exhibited instructive diagrams, showing the number of hits on targets at different ranges made by the shrapnel shell and case shot now used. The latter struck me especially as being far more numerous than I should have expected. These diagrams were said to have produced quite a nightmare at Aldershot, so I have refrained from borrowing them for this afternoon. It is true that the table of losses appeared to reassure some of the speakers, but I think I have shown it is not very trustworthy, and in any case would hardly apply to the future.

In the war of 1866 the German artillery were badly handled and could not shoot, and in 1870, although it was well handled and shot with precision, it fired but very few shrapnel shell, and had, I think, no time-fuzes; while the French fired a good number of shrapnel, but with fuzes only adapted to a few ranges, and could not therefore be effective. I think but scant justice has been done of late to General Boxer, R.A., who made so many improvements in the shell and fuzes, and I do not hesitate to say that had British artillery taken part in these wars, the enemy would have been considerably astonished by our shrapnel fire, and would have suffered much from it. At that time only ourselves and the Austrians put the bursting charge at the base of the shell. I myself fired spherical shrapnel shell with terrible effect over the heads of our assaulting troops, at the left flank of the Redan, 35 years ago, and our field batteries used shrapnel in the Crimean war; and during the Mutiny in India we fired shrapnel at Lucknow with the fuze inwards to act as case, a similar method to that (setting the fuze at zero) recommended by Prince Kraft now, and which has long been understood in our Service.

The rifled guns first introduced, and those used for many years after, were fired with small charges compared to those of the old smooth-bored guns; and even in 1866, many of the German Officers, who were then much behindhand in artillery matters, concluded that

there should always be, as they had at that time, a certain proportion of smooth-bored field guns, for shrapnel and case, owing to the low velocity given by the small charge of their rifled guns, which were not effective.

Now, in consequence of the large charges and better adaptation of the powder and dimensions of the bore, very high velocity is given to the shells, and this has immensely increased the power of shrapnel shell fire. These shells can be fired with destructive effect at much longer ranges and at lower angles of elevation, so that more ground is rendered dangerous by the bullets after the shell bursts; and I am told that they can break through shelter-trenches, buildings, and obstacles of small strength, and still be effective inside of them, even with percussion fuzes, which would have been useless with the shrapnel from the older guns. We thus see that there has been, during recent years, the development of a more destructive fire from artillery. There would be a disadvantage in the high velocity if firing from below at troops or guns posted just behind a ridge, and in some other cases, and there might be premature bursting, a serious thing if firing over the heads of our own troops; but I understand that with the steel shrapnel now made it does not occur; on the contrary, the shell does not break on explosion, which is a disadvantage. I stated this objection of premature bursting some years ago in the discussion after an able lecture in this room by Major-General H. Brackenbury. There is also another disadvantage resulting from very high velocities, viz., greater difficulty in regulating fuzes, the intervals of time corresponding with differences in ranges being so much less than with the lower velocities. The bursting charge is placed in the head of this shell, to give room for a few more bullets; but this is against the principle of the shrapnel, and must cause retardation of the bullets.

In an attack on an entrenched position, or in firing at guns or troops posted or moving in ground pretty well sheltered from shrapnel fire, or at artillery either in the open or in gun-pits, common shell will have to be used. Remember that the effect of a common shell on explosion acts all round, while that of a shrapnel lies mainly in a forward direction. The force from the explosion of a common shell is capable of dismounting guns and destroying carriages, while the flame explodes ammunition boxes, and sets fire to combustible objects. And I can assure you from experience that the explosions of shells, dropping over cover and bursting, so as to hit those apparently under secure shelter, have a demoralizing effect not to be despised. This is especially so with vertical fire; I am not going to propose mortars for field service, but I have long thought that a few batteries of rifled howitzers, firing shells with large bursting charges, would be often valuable in the field, especially for attacks on entrenched positions; for being fired with smaller charges and at higher angles than shrapnel shell, they could reach objects quite secure from the latter. I cannot see the object of firing common shell with very high velocities in the field, the effect on men and horses under cover, or on guns, wagons, ordinary buildings, &c., being thereby diminished. I

should think it very doubtful whether tough steel is a good material for common or other shells. Then the effect of shells can be increased by having bursting charges of *mélinite* or other more powerful explosive substances than gunpowder. I am told by the best authority in this country that the application of high explosives in shells is being rapidly and successfully developed; this will be a means of greatly increasing the power of artillery.

It is sometimes objected that common shells are liable to bury themselves harmlessly in the ground, with or without bursting, as many did in the actions during the war of 1866; but that many of the Prussian shells were blind is not very surprising, for Prince Kraft says: "I could also name to you some large bodies of artillery whose shells were blind, simply because, in the projectiles furnished at the renewal of their ammunition from the columns, they had forgotten, as was afterwards discovered, to insert any percussion arrangement." And he adds, "it is difficult to see how the shells could have been expected to burst." Fuzes are sometimes said to be defective when the fault has arisen from irregularity in boring or setting them.

It will be of little use to have powerful guns if Officers and men are not thoroughly trained in gunnery, so as to employ them in the most efficient way. An artillery that goes into the field at the present time, without the requisite gunnery training, will be very soon knocked to pieces by an opponent who has acquired the art of shooting, notwithstanding any superiority in armament the former may possess. Although Prince Kraft may now teach us a great deal, founded on his unrivalled experience in the command of artillery in war, there is little doubt but that he and other Officers of the Prussian artillery, who effected such a transformation in their systems of both gunnery and tactics between the wars of 1866 and 1870, learnt a good deal from us. Long after the establishment of our School of Gunnery at Shoeburyness,¹ the development of the artillery course at the Royal Military Academy, Woolwich (in which I had some share), and the foundation of the Royal Artillery Institution, and of this Institution, for distributing throughout the Service artillery literature of the most valuable kind—the Prussian artillery was in the most benighted condition. Independently of taking their tactics from the war-time of 1815, their School of Gunnery was not formed on an adequate basis till after the war of 1866 had shown such lamentable deficiencies in shooting; and then, as Prince Kraft tells us, "a singular fate was reserved for the scientific arm. It had to accept the principles of the unscientific infantry, the rifled firearm, and the breech-loader, and also their method of theoretical instruction," and "that a number of instructors had first to be taught," and that "the year 1867 was nearly over before a sufficient number of instructors had been provided to teach the troops a rational manner of shooting."

Notwithstanding the valuable results accomplished by our School of Gunnery at Shoeburyness, it has two disadvantages. One, that it

¹ 1859.

is combined with the Experimental Department; this is an advantage itself in some ways, as the courses and batteries trained there can acquire some acquaintance with the new matériel introduced from time to time; but, on the other hand, one department must interfere more or less with the other as regards convenience of practice, and I have often noticed it when there in command of cadets or field batteries. The second disadvantage is that a flat range over sands is a very imperfect one for field artillery practice, as it does not represent the conditions of service. But the Government took the wise step, in 1877, of forming annual practice camps at Hay and Okehampton, where field batteries can be trained on ground such as would be met with in actual warfare; in these they can be taught to fire at dummy troops or guns, on different kinds of ground, at varying levels, in the open, or protected by shelter-trenches, gun-pits, parapets of earthworks, or behind folds in the surface.

Careful instructions are laid down for the practice of horse and field artillery at these practice camps, and four descriptions of practice are carried on, viz., elementary, competitive, battery service, and brigade service. The two latter are conducted, as far as possible, under service conditions, and as they are at unknown distances, a method of finding the range, called *ranging* a battery or brigade, is adopted, consisting in three processes: (a) finding the long bracket, (b) finding the short bracket, and (c) verifying the range; the bracket being the distance between the ranges of two shells, one under and one over the object. Our batteries are provided with range-finders, and have observing parties which, by signalling, can show the effect of the fire; and to test the supply of ammunition from the wagons, the full number of rounds to be fired is not carried in the limbers.

The Germans lay much stress on practice at moving targets, not merely crossing the front at right angles, but obliquely, and advancing towards the battery, and selecting some point of ground over which the target must pass, and laying the guns on it; as we should do in firing from a coast battery on a vessel in motion attacking or passing it. They do not appear to attach so much importance to ranger-finders in the field as we do, trusting to the burstings of common shells. These methods of firing at targets moving in different directions are laid down in our Field Artillery Drill Book and in the instructions for our practice camps, and are carried out there by the batteries.

Hitherto four horse or field artillery batteries practised annually at Hay, and nine batteries in three divisions at Okehampton; but as Hay is unsuitable for 12-pr. B.L. or 13-pr. M.L. guns, thirteen batteries will go to Okehampton this year.

It only remains to take full advantage of these practice camps. It is said that the shooting season might be lengthened by adding a month at the beginning and another at the end; that more batteries might be sent at one time; and that they might be kept more continuously at work while there. These would involve increased expenditure of ammunition, and the steel shrapnel shell are each costly, but much of the practice can be carried on with the ordinary

cast-iron shells. Elementary practice in loading, laying, and firing a gun at targets at known or unknown distances can be done on any ordinary range like that at Shoeburyness. These machine-guns and magazine rifles should be tried against artillery, and for this purpose some infantry might be sent down to Okehampton. There is said to be little practice at unseen objects, and not a sufficient variety in the works fired at.

We hear a great deal now about quick-firing guns, and they are doubtless formidable weapons in fortresses, coast batteries, and ships, but I cannot see how they could be used to any extent in the field, as they require to be fired continuously from the same position without recoil. I have often thought that our field carriages might be improved by having recoil slides or some arrangement for lessening recoil. If the recoil could be prevented, both accuracy and rapidity of fire would be increased, the labour of running up would be avoided, and guns could be placed, as Captain Stone has pointed out, in positions otherwise impracticable.

The non-recoil carriages now made by Nordenfelt, Armstrong, and other companies are a great advance as far as they go; but although the compressors and breaks stop the running back, they do not prevent motion sufficient to throw out the laying to some extent, and the strain on the carriage puts a limit to the calibre of gun that can be fired from them. A 6-pr. is the gun recommended for horse artillery, but the shells of such a piece would be insignificant compared to those of the 12-pr. service guns. They might, as their advocates say, fire a greater weight of metal in a given time, but I think this is a fallacious comparison; and great care would have to be exercised to prevent quick firing being indulged in too often, or for too long a time, with consequent running out of ammunition. No doubt quick-firing guns are admirably adapted to some purposes for which horse artillery are employed—advanced guards, retreats, surprises, &c.; but horse artillery are often wanted to join the line of a mass of guns, and to oppose powerful field-pieces. Quick-firing guns have the great advantage of requiring so few men to work them, and being free to move in any direction, of giving great facility for following objects in motion.

Then with respect to the Maxim, the latest development of the machine-gun, we heard that Mr. Maxim, in reply to Lord Wolseley's remark, "If you can invent a machine-gun which will pump lead on troops or guns at a distance of 3,000 yards you will create a new departure in all the military tactics in the world," said, "that he had done it;" and, further, "that I will not only pump lead 3,000 yards, but also 4,000 yards, with great facility." It may, however, be suggested, that artillery might be able to return this storm of lead with the addition of a certain amount of iron, explosion of shells, and fragments, that might serve to knock the Maxim machine-guns about, damage their action, and dismount them; also that infantry or cavalry would not be inclined to remain quietly exposed to such a storm as a target for the Maxim gun. I am quite ready to allow that the Maxim gun is a very formidable weapon when used against any troops at

comparatively short ranges, if they are in pretty close formations and in confined situations, but at long ranges the effect cannot be observed, and their fire is of little use against matériel, whereas if struck by shell they are very liable to be disabled.

Of the effect produced by the rifled field artillery of the French in the war of 1859, or of that by the breech-loading small-arms of the Prussians in 1866, there was no doubt; but it can hardly be said that the war of 1870 was much influenced by the French mitrailleuses, although they at times caused a great deal of destruction. In my work on "Modern Artillery, 1873," I gave a number of instances, collected at the time, of the employment of mitrailleuses in action. One was as follows:—At Gravelotte, a mass of German batteries (84 guns) came into action against a somewhat similar number of French guns and a battery of mitrailleuses. "As the batteries galloped up, vast numbers of French shells burst short in the air, or on the ground in rear, but struck nobody; a continuous rain of mitrailleuse bullets also fell into a particular hollow behind them where nothing was; but the German commander of the first three batteries in action directed their whole fire to be given together on the first French mitrailleuse on the right; thereupon, a confused storm of explosions was seen to spring all over where the mitrailleuse had stood, succeeded only by a vacant space with some wreck on the ground; the same treatment was adopted with the second and third mitrailleuses, on which the fourth vanished of its own accord."¹ The rapid destruction of the machine battery was not confirmed by Froissard, but he admits that it lost a great many men and horses, and had to be withdrawn with the aid of the French infantry supporting it, and it is evident that its fire did no harm. On the other hand, some mitrailleuses held their ground against artillery and repulsed infantry, but they were behind epaulements on the heights of Villette.

It may be said that the Maxim gun is a great improvement on the French mitrailleuse then used, but small-arms and field-guns have been also greatly improved since 1870.

In the discussion after Captain Stone's lecture at Aldershot, Major Hutton stated, that although the Nordenfolt gun made excellent practice on a level range, their effect was small at ranges of 1,450 and 1,120 yards when fired on ground under service conditions, the distances being accurately found with a range-finder; this was attributed to the wheels of the carriage not being level, but the firing party thought they had done considerable execution. This ignorance of what you are doing is a great objection. Then Major Mechem stated that the smoke was so dense that the target was hidden, but this difficulty might be obviated by using smokeless powder; he also stated, that at 400 or 500 and 1,100 yards the rifles of infantry made much better practice than the machine-gun.

Major Hutton also gave an instance from the war in Egypt, where the machine-guns had to stop firing, as they dropped their bullets among their own infantry, over whose heads they were firing, although

¹ Taken from "Observations amongst German Armies during 1870," by Colonel H. A. Smyth, R.A.

the ranges could be easily calculated by telegraph poles. I agree with what Mr. Nordenfelt said, that "the rifle calibre gun will not take the place of the shell-firing gun."

A few machine-guns might be useful with the infantry escort for artillery, in keeping down infantry fire upon the guns, and resisting any sudden rush upon them. Some infantry Officers say that machine-guns attached to infantry rather tend to impede them, as infantry can move over ground impracticable to carriages; but organized in small batteries, as suggested by Captain Stone, they might greatly assist infantry or cavalry in close action.

We now come to the ranges at which guns should be fired in the field. In the first edition of my work, "Modern Artillery," published in 1870, I put them at from 1,000 to 2,500 yards, and for position guns some hundreds of yards further, always insisting that the longest *effective* ranges should be chosen when practicable; and, as these agreed with those laid down by Prince Kraft in a pamphlet he wrote shortly after the war of 1870, entitled "The Employment of Field Artillery," I kept to them in the edition of 1873. I added that in some cases when guns were attacked by infantry or cavalry, or if they could be brought suddenly on the flanks of an enemy's troops, very short ranges might have still to be used, but that breech-loading small-arms and machine-guns should render ranges under 1,000 yards very dangerous to artillery. Now that field-guns give such high velocities to their shells, greater *effective* ranges can be employed, and we may, I think, accept with confidence those given by Prince Kraft. He says: "The effect of artillery is noticeable at 5,500 yards. The effect of shrapnel begins at about 3,800 yards, and at from 2,000 to 1,500 yards is decisive, while at from 1,100 to 1,000 yards and under the effect of artillery is absolutely annihilating: always provided that its field of fire be open. Since shrapnel with the time-fuze set to zero have become so murderous in their results, the effect of artillery at very short ranges, which had been diminished by the former inferiority of the case for rifled guns, has now again become annihilating." I don't know whether he means to imply that case shot should be abolished, but I do not think it would be wise to do so. I don't think shrapnel with fuzes set to zero are very effective at ranges under 300 yards. I am no advocate of very long ranges, which are apt to lead to waste of ammunition; and time-fuzes are not adapted to over 3,200 yards range.

We must, however, always remember that the effect of artillery fire, like that of other firearms, is influenced by many circumstances in actual warfare, and not expect the same results as can be obtained on a practice ground. Battles are not generally fought on level plains in fine calm weather with no smoke, dust, or noise, or the issue might be like that of the combat between Kilkenny cats. Battles are often fought in foggy or rainy weather, when field-glasses are of small use, and when objects cannot be seen at long ranges. Both at Inkerman and Sedan the engagement began in a fog. At the former the projectiles of the Russians came crashing into our 2nd Division camp almost as soon as the pickets were engaged, the enemy knowing the

range; and at the latter, the Prussian guns could not at first open fire. Then high wind and heavy rain both tend to disconcert accurate practice. The next hindrances to accurate fire are the clouds of smoke and dust often hanging about, from the firing of guns and small-arms, the bursting of shells, and the movements of troops. Also the horrid noises caused by these, and the frightful gaps made in bodies of men and horses, the destruction of guns and carriages, and the blowing up of limbers and ammunition wagons, are enough to shake the nerves of the bravest troops, and make their shooting more or less unsteady. Besides these, the guns are not, as in sieges, fired from platforms, and must be run up after each round, often on soft or rough ground. Those who think that the effect of artillery fire is chiefly moral should remember that the fire of small-arms in battles is not always what might be expected from practice at a School of Musketry, and I think Lord Wolseley himself remarked on the inferior shooting of the infantry in the Egyptian War.

Lord Wolseley has recently called attention to circumstances that may greatly modify the tactics required in future wars, but I think some of them are scarcely ripe for consideration, at least at present. He says: "One remarkable change will be the absence of nearly all that terrific noise which the discharge of 500 or 600 field-guns and the roar of musketry caused in all great battles. We shall have practically no smoke to mark the position of the enemy's batteries and troops in action. The sound of cannon will be slight, and will no longer indicate to distant troops where their comrades are engaged, or the point upon which they should consequently march. Our sentries and advanced posts can no longer alarm the main body upon the approach of the enemy by the discharge of their rifles." I don't think we have yet reached the time when there will be an absence of smoke in warfare. Powder giving off little smoke is used for sporting purposes, and the French, ourselves, and others are working to perfect a smokeless powder, the explosion of which causes less noise than that of ordinary gunpowder, and if it can be used with success, some modifications in tactics may be necessary; but whether such powder can be made for ordnance is questionable. I wrote to Sir F. Abel on this point, and from his official position he could only send me the following guarded reply, but it is sufficient for my purpose: "Comparatively smokeless powders are likely to come into extensive use for small-arms within a brief period; such powders do produce considerably less noise than black powder. It would at present be premature to hazard an opinion as to the extent to which powders of that description are likely to displace gunpowder of the present types in artillery."

That artillery will certainly not use smokeless powder for shells must be evident, for the smoke from the bursting of the shell is an admirable guide to range and effect, and the noise of the explosion only affects the enemy, and is therefore an advantage, although it is but a moral one. As to other noises in action, there will always be the *pings* of the bullets, and the horrid screamings of the shells as they pass through the air.

With respect to field artillery drills it is pretty generally admitted that they may be simplified with advantage. I had the command of from two to six batteries for some years, and never attempted, nor asked other Officers to attempt, some complicated manoeuvres that would not be required in the field. Prince Kraft says on this point: "Judging by my experiences in war, and you will own that in matters connected with artillery they are fairly numerous, the only movements which are of use in the field are, the advance in column of route, deployments, and the advance in line." I think you might add some others, such as change of front and methods of retiring. With what he says of the uselessness of galloping over short distances we should most of us, I think, agree, increases of a few hundred yards range being easily obtained with our present guns without moving. What is chiefly wanted, as he points out, is mobility over long distances in getting to the front on the march. He says: "It is no longer, as it used to be, desirable to gain a few seconds, in order to fire the first shot quickly; on the contrary, a long time is now taken over the first shots, in order to lay and observe them quietly and accurately. It is now a matter of hours, which we must endeavour to gain in coming into action." He writes: "The introduction of rifled guns, and the experience which was obtained in 1866, considerably altered the demands which must be made on the mobility of the artillery. The necessity of employing the great artillery masses early at the beginning of the fight demands quickness of movement, not over distances of 200, or at most 1,500, paces, but over distances measured by miles and days' marching." He mentions an instance when he had to trot 14 English miles in order to come into action, in 1866, but he adds: "Even greater demands than these must be made upon the artillery when it is a question of moving artillery from one flank of the theatre of war to the other, or of sending them quickly to bodies of troops which have been detached to a distance." "For example, the 1st Horse Artillery battery of the Guard marched, on 13th August (1870), 32 English miles from Bermering by Aron to Dieulouard, where it encamped on the same evening."

It is satisfactory to find that the practice of making long marches at a quick pace is not neglected in our Service. In December, 1887, Major Turnbull's battery of horse artillery marched in India 47 miles in 9 hours and 40 minutes, exclusive of two halts of 1 hour and 1½ hours, and three or four short halts. The first 2 miles was across country, the rest over a metalled road up and down hill. In order to make these long marches, horses must be in good hard condition, not merely fat and sleek, as is sometimes thought requisite for our inspections. Lord Wolseley's criticism on the burnishing of "everlasting bright chains" may be just or not, but it is evident that harness must be cleaned properly or it will not last, and may gall the horses.

The importance of coming into action early and quickly cannot be overrated, for batteries in action have a great advantage over those coming into action, and infantry will seldom dare to attack in front a line of batteries in action. The Germans hold strongly that artillery in action cannot be driven back by infantry. Prince Kraft says:

"There were hundreds and thousands of cases in the war of 1870-71 where artillery which refused to retire could not be driven back by infantry fire;" and, "I repeat once more, and I cannot too often repeat, *artillery cannot, speaking generally, ever be driven back by infantry if it refuses to leave its ground.* On the contrary, when infantry fire is really hot, it cannot for the moment fall back, since so many of its horses will then be shot. But, nevertheless, nothing is lost so long as there are a couple of men left with each gun, who can load and lay quietly; it can thus go on doing its work until the last gunner is disabled." He warns us, as Colonel Brackenbury pointed out, against the errors that grow up in a long peace, and the terrible harm which umpires do at peace manoeuvres by ordering guns back when under the fire of infantry.

The following instance is instructive as showing how artillery fire should be directed against advancing infantry. Prince Kraft says: "Standing behind the Captain of a battery in action, as troops were advancing to attack him, I heard him quietly give the order: 'Against infantry in front, 1,900 paces from the right flank. Ready. Fire one gun.' Then he waited, holding his field-glass to his eye, until the enemy approached the point on which the guns were laid, and gave the order: 'Rapid firing from the right flank.' Then there was a hellish sight, for the advancing enemy disappeared from view in the clouds of smoke which the shells threw up as they burst and tore their way through his ranks. After one or two minutes, the attacking enemy came out on our side of the smoke. It had passed the point on which the guns were laid, and, in spite of terrible loss, approached with undeniable bravery. Then the Captain gave the command: 'Cease firing! 1,600 paces—one gun!—cease firing!' and when the enemy drew near to the new point on which the guns were now laid, he cried: 'At 1,600 paces—from the right flank, rapid firing!' The effect was brilliant, horrible, and overwhelming. No attack could have resisted it."

It seems to me that, although artillery may in most cases be able to defend its front, it does not follow that infantry cannot attack it successfully under various circumstances. Its position may be turned and infantry succeed in getting on its flank at a few hundred yards range; and after the first furious artillery duel many batteries will be more or less disabled, and perhaps out of ammunition, when they might fall a prey to an infantry or cavalry attack well executed; hence the necessity of always providing a strong escort on exposed flanks of a line of guns, and putting horse artillery on such flanks. At first when guns are firing at long ranges there will be no danger from other arms, but battles cannot be decided at several thousand yards distance; troops must come to close quarters, the batteries may have to advance and may get entangled with other troops, or at any rate have their fire impeded by them, and opportunities may arise which may give an enterprising enemy a chance of taking artillery at a disadvantage.

Prince Kraft gives an instance from the Battle of Königgrätz: "Thanks to the impetuosity and the rapidity with which our infantry

rushed to the front, the numerical superiority of the enemy's artillery could not, for want of time, produce at this phase of the struggle such a tremendous effect as it did at other points and at other moments in the course of the battle. It was, no doubt, on account of the very high corn, and of the smoke produced by the rapid fire which it kept up on our batteries, that the Austrian artillery were not able to follow with the requisite attention the advance of our foremost lines of skirmishers. It was these lines which, suddenly and at almost point blank range, overwhelmed the enemy's guns with a rapid fire, and captured 68 guns of this long artillery line (the 1st Division of the Guard took 55 and the 2nd Battalion of the 50th Regiment 13 guns). The others succeeded in escaping." The Prussian guns were just opening fire, and seeing some Austrian limber boxes explode and their line of guns cease firing, Prince Kraft and others thought their artillery fire had produced this result; but the explosions were due to the explosive bullets of the Prussian infantry. Hoffbauer gives an instance from the Battle of Mars-la-Tour of infantry inflicting considerable damage on artillery at a long range. He says: "From the moment of passing the defile which runs from Flavigny towards the south-west, the 1st Horse Artillery battery suffered severely from hostile infantry behind a hedge 1,500 paces distant." This case of infantry under cover and undisturbed quietly potting at a battery on the move is no indication of the proper range for infantry to engage artillery in action.

If it is of importance to come into action quickly, artillery serving merely as a target while doing so, it is necessary that when in action the fire should be deliberate at first while picking up the range, but when this is found the fire may be rapid, the effect, however, always being carefully noted, and any necessary alterations made in laying the guns and regulating the fuzes. There should be no salvoes except at close quarters, or random shooting of any kind. In firing on artillery several guns should be concentrated on one of the enemy's pieces until it is silenced, when the same fire should be turned on another.

The old rule was to fire common shell to damage or dismount guns and carriages, and to blow up limbers and wagons; and shrapnel shell to kill or wound men and horses, and I see no reason why it should not still apply. Now that shrapnel shell can be fired with percussion fuzes, which was not formerly attempted, they can also damage matériel and might blow up ammunition boxes, but common shell would be more effective for such purposes, and are less costly than shrapnel; and Capt. St. J. Ord, R.A., who has been Staff Officer at Okehampton for three years, tells me he does not consider percussion shrapnel suitable for firing against artillery, the intervals being too great and the bullets not having a very wide dispersion. He says respecting fire at artillery: "(1.) If your enemy's battery is in action in the open but no limbers or wagons visible, *i.e.*, just on the crest of a hill or a little way down the forward slope of it, then the proportion should be $\frac{2}{3}$ common to $\frac{1}{3}$ shrapnel, that is to say, out of every 6 rounds 4 should be common and 2 shrapnel, the great object being to

dismount or damage the enemy's guns. (2.) Supposing the enemy's battery is in action with its limbers and horses visible, then after finding the range¹ I consider the right proportion to be $\frac{1}{3}$ common and $\frac{2}{3}$ shrapnel, i.e., 2 common to 4 shrapnel in each 6 rounds. The shrapnel should do much damage to the horses, always a very large target, and, with the very accurate sights (Scott's) now in the Service, there is great likelihood of the guns being damaged also." When the enemy's artillery is protected by natural or artificial cover, common shell must be used. Shrapnel shell is obviously the best projectile to use against infantry or cavalry when exposed or only protected by slight obstacles; but against troops protected by the nature of the ground or substantial cover common shell should be employed, as also against buildings or obstacles of solid construction.

One of the most important questions affecting the value of artillery in the field is that of the supply and renewal of ammunition, the arrangements for which should not only be thoroughly considered and laid down, but practised when possible in peace-time.

Breech-loading rifled guns can be more quickly fired than the old M.L. smooth-bore pieces, and when masses of artillery are pushed early into action, a very large number of rounds will generally be fired. It is an established principle in the German Service that "the ammunition in the wagons should first be used and that in the limbers kept as a last reserve;" and Prince Kraft tells us that, in 1870,—"so long as the permissible slowness of the fire rendered it possible to do so, every shell was to be taken direct from the wagon, with which object a wagon was posted in rear of No. 2 and another in rear of No. 5."

Ammunition was allowed to be taken from the gun limbers only in two cases; to fire the first shot in a new position before the wagons had come up, and when a rapid fire was ordered. But as soon as the critical moment had passed, the limbers were as quickly as possible filled up from the wagons." And he says: "I found in the battles of St. Privat and Sedan, when I rode along the line of batteries and looked into the limber boxes they were full. And when at St. Privat we accompanied the infantry to the assault, the batteries reached the heights which had been captured between St. Privat and Amanvillers, and also the closer position near to St. Privat, *with full limber boxes.*"

He appears to advocate posting the wagons in the same line as the guns if there be sufficient space, and contends that they will suffer less if so placed than if they were 300 or 400 paces in rear; for he says: "In these days of rifled guns the space of 300 or 400 paces in rear of the battery is more dangerous than a position near to the battery and in a line with it, owing to the splinters of the shells which spread about it in all directions. The enemy's rifled guns shoot so well that their shells do not go sufficiently wide of the mark to hit the wagons. For the enemy does not lay on the wagons, but on the guns, which are firing at him," and to prove this he points out that—"during the whole of the Battle of St. Privat no wagon was blown up, but only some limbers." I am not quite satisfied on this

¹ Which would be done by means of common shell.

point; I think an enemy would fire at wagons as well as guns, and try to blow them up, as guns are not of much use without ammunition, to say nothing of the moral effect and probable killing or wounding of gunners, drivers, and horses by the explosion.

The supply of ammunition in action being so important, the wagons should follow the guns as closely as practicable, and the 2nd line of wagons should be within reach. Prince Kraft, citing a case from the war of 1866, in which some batteries were separated from their wagons, and the latter did not come up till the action was over, remarks: "But I learnt one lesson by this: *never again to allow the batteries to be separated from all their wagons.*" He goes into detail respecting the renewal of ammunition in the lines of wagons from the columns, and field depôts, but similar arrangements have been laid down for our Service. In peace manoeuvres the wagons, under the Captain of the battery, should follow the guns, this Officer selecting good positions for them as regards supply and shelter; unfortunately, at the present time many of our batteries have no wagons.

I pointed out in 1873 that just before the war of 1870 some military critics adopted, from Chalons I think, peculiar ideas as to the employment of field artillery, one of their axioms being—"Concentrate your fire but not your guns," but after the war they appeared to be under the impression that the Prussians had discovered new tactics in massing their guns. Artillery masses had, however, been employed by Napoleon, by the Allies against him at Gross-Beirin and Leipzig, by the Russians at Warsaw and Inkerman, by ourselves at Waterloo, in India, and the Crimea as far as we were able, although one great opportunity was thrown away, by the French in 1859 and by the Austrians in 1866. It is strange that the Prussians, who were then ahead of the other Powers in the weapon and management of their infantry in action, should not have observed these cases and changed their artillery tactics accordingly, but as Prince Kraft says, they still adhered to the traditions of 1813-15 up to 1866.

Napoleon's tactics were to commence an action by sending on light troops and opening a desultory cannonade from various points, to make the enemy compromise his whole force and obtain a knowledge of his position. At the decisive moment an overwhelming fire from a mass of artillery was poured upon a weak point of the enemy's line, and after it appeared to have produced the requisite effect, a large force of infantry, preceded by light troops, advanced to the attack, and accompanied by the light guns up to case shot ranges, cavalry being kept ready to complete any advantage gained. Against breech-loading small-arms and machine-guns artillery could not be sent forward to such ranges without risking annihilation: but there is now no necessity, as rifled guns can shoot as well at 1,200 or 1,500 yards as at 300 or 400 yards. Artillery may have to fire over the heads of their own troops when advancing to the attack, and our shells should, therefore, be made so that they may not be liable to premature bursting.

It is now generally held that artillery should not be kept in reserve, hence the Germans, and others after them, have changed the term

reserve into that of *corps artillery*; and it is pushed on as far forward as practicable on the march, so that by its fire it may conceal the movements of the infantry when coming into action. This might sometimes be hazardous, as pointed out by General Sir E. Hamley in his "Operations of War," 3rd Edition.

It is sometimes said by Officers of other arms that artillery Officers endeavour to make a mystery of their arm, and this complaint has been echoed even by some artillery Officers. I have seen little to justify such a complaint. The details of gun and ammunition are rather complicated in these days, but it is hardly necessary for Generals or other Officers to master these. All they want is to know—what the fire of guns can do under various circumstances, the spaces batteries occupy in different formations, with a general idea of their tactics. To obtain the first it would be wise to give General and Staff, as well as other infantry and cavalry Officers, when practicable, the opportunity of visiting Okehampton, Shoeburyness, and other Gunnery Schools, and observe the practice there; and these Officers might make valuable suggestions respecting the positions of targets representing troops and in other matters.¹ The others can be got from the drill book and the movements of artillery at manœuvres, if they are directed by General Officers and Officers commanding batteries, in an intelligent manner.

The orders issued by H.R.H. the Duke of Cambridge at Aldershot, just before the autumn manœuvres of 1871, abolished the old-fashioned notion still held by some Generals and Officers commanding troops—"that field artillery should *conform to the movements of the other arms*;" and detailed instructions are now laid down in the "Field Artillery Drill Book" as to the position and functions of Officers in action, the Officer commanding the artillery taking his orders as to the object required, from the General or other Officer commanding the troops. They are worded to secure unity of action with necessary control.

One of the great difficulties we have as a nation to contend against is the occurrence of a number of small wars in various parts of the world, against enemies of different kinds, some mere savages, others having firearms of a sort, others organized and possessing rifled small-arms and artillery, and at the same time to be prepared to take a part in a war on the Continent; and to take even a small part in such a war, where such enormous armies are employed, a great strain on our resources must always be placed. No one with any knowledge of the requirements of active warfare will deny that we are very weak in artillery. There is no field artillery for militia or volunteers, and but an inadequate amount for our regular Army, as I think I can show.

¹ I am informed by Captain G. A. K. Wiseley, R.E., that in Belgium every infantry regiment is required to send a Captain to attend for fourteen days the artillery gun practice, and, as there are seven of these courses annually, each regiment has seven Captains instructed every year. Captain Wiseley adds: "I was assured that this instruction is considered most valuable, as enabling the infantry to appreciate the progress in artillery."

It is, I understand, the intention of our authorities to have two Army Corps, organized so that with the help of reserves it may be put on a war footing without delay.

Now each Army Corps will require—

	Field batteries.	Horse batteries.
Divisional artillery	9	..
Corps artillery	2	3
Ammunition columns	7	..
	—	—
Total	18	3
Two Army Corps	36	6
Cavalry division .....	..	2
Ammunition column	1	..
Lines of communication	2	..
	—	—
Total batteries	39	8

Fifteen field batteries are to be converted into ammunition columns, but as we have only thirty-eight field and nine horse artillery batteries at home, we should be short by one field battery, and have only one battery of horse artillery and the depôts for emergencies and relief.

Now consider the condition of our batteries at home. Until just before I went to Aldershot in 1879, all our field batteries had 6 guns and 6 wagons, with 92 or 84 horses, but some of the wagons were then reduced. Not long after, in some batteries the guns were reduced from 6 to 4, and now there are 4 horse and 16 field batteries with only 4 guns. As a consequence the establishments were reduced, so that they have recently been weaker than they have ever been since the Crimean War.

The home establishments are now—

	Total ranks. Men.	Horses.
Horse artillery	{ 167	104
	{ 125	72
Field artillery	{ 166	86
	{ 154	74
	{ 115	50

The war establishments are—

Horse artillery	186	193
Field artillery	177	141
Reserve ammuni- { 1 section	190	221
tion columns { Other sections	207	258

Where are you going to get *trained* men and horses to make these numbers complete? You have a small reserve of artillerymen, but remember that you will want about one-third more men and horses to make up casualties after a few months' campaigning. The new

plan of registering horses in civil employ may give us numbers, but will they be trained to stand fire? And many of them will probably be much "used;" and, besides artillery, the cavalry, Army Service Corps, and other troops will require large additions.¹ Then you have India to provide for, and in the event of a war with one of the greatest European Powers, we should certainly have to fight there as well as on the Continent. You may get horses in India, but you must send men there in peace-time, and very large drafts during a war. Whether you form more batteries now or hereafter, as you may be forced to do, all batteries of field artillery should have six guns and six wagons, which is a mere peace establishment and which would not entail very great cost. I should like to ask what is meant by the heading in the "Detail of an Army Corps" of "Guns—four or six horsed." The Berlin correspondent of an English newspaper stated the other day that "in order to enable the German artillery to be mobilized as rapidly as the French, it is intended completely to horse it in time of peace, as is already the case in France."

In a paper recently written by Major-General Stothard, late R.E., in Colburn's "United Service Magazine," he gives ninety-six guns to a German Army Corps of 37,179 of all ranks; but some three years after the War of 1870, the artillery of the Guards Corps and first eleven Army Corps was increased to 102 guns, as I stated at the time on the authority of our Topographical Department. The French have a higher proportion than the Germans, but it is said that a Bill involving a very large expenditure is shortly to be introduced in the Reichstag to complete the German artillery. In our Army Corps we have only 84 guns to 34,984 men; 14 machine-guns are added, but they are not artillery, and if considered necessary will doubtless be added by foreign Powers to assist the other arms.

We are all aware of the difficulties to be surmounted, both by the military authorities and by the Government, in their attempts to carry out the recommendations of the former, when these entail the expenditure of money; but no effort should be spared to open the eyes of the British public to the deficiencies in our military and naval establishments. It would be folly to attempt to satisfy the ideal wants of certain soldiers and sailors, and some of these are rather apt to treat what should be a sober matter-of-fact question in a gushing or sensational manner; while the British public, upon whom, by our extraordinary method of politics, is devolved the power of consenting to or rejecting proposed measures, was said by one of our greatest authors to be "composed mostly of fools." Without endorsing such a sweeping assertion, it can hardly be denied that the British public is not very enlightened on military questions. I met a commercial gentleman when quartered at Sheffield a few years ago, who seriously maintained that it was a great mistake to keep up any army, and that

¹ At Aldershot last autumn four guns of a battery of horse artillery were equipped for service with a flying column. To make this reduced battery up to the requisite strength, the draught horses of the remaining two guns, the whole of the draught horses of another battery, and some of the draught horses of a third battery had to be taken.

war could be carried on most cheaply and successfully by entrusting the management of it to a contractor. Then, last year, in order to obtain evidence on the best methods of training Officers for the Army, a Parliamentary Committee called an accountant before them, whose opinions on such a subject were worth nothing, and he was questioned by an old artillery Officer, who should have known something of the matter, the result being, as was doubtless desired, a recommendation to abolish all military colleges and schools as too expensive, and trust to chance training, as was done some century or two ago.

I have no wish to criticize those who are endeavouring to place the Army on a solid footing, but there is a tendency to suppose that everything has to be commenced afresh. Much has been done during the last 30 years, and improvements have been constantly carried forward, although there was one period of stagnation. Many of those who worked hard and did most to improve matters have been got rid of, and their successors are not always grateful for advantages already secured. Our armaments have been immensely developed; both Officers and men are better educated and trained; the science and practice of gunnery, musketry, engineering, mining, &c., have made great strides; short service has been adopted, which has given us a reserve of men; the Volunteer Movement has been established; the transport, supply, and other services have been placed on a recognized footing; autumn manœuvres and minor tactics have been practised; and a number of small wars have kept alive the military spirit, and, to some extent, tested our deficiencies. As for the artillery, which has been re-organized several times since the Crimean War, an important step was taken shortly after, in placing field batteries on a proper footing by making them permanent, and giving them a proportion of drivers, and their mobility was afterwards increased by mounting the gunners on the limbers, axletree-seats, and wagons; but few would say that the present incomprehensible organization of the regiment is satisfactory.

I trust that no one will suppose that in what I have said I have made any attack on so distinguished a soldier as Lord Wolseley. I have certainly contended against one of his opinions, which I and many others consider unsound, and my reason for doing so is, that his opinions naturally carry so much weight from his abilities and position. I have, however, confidence that Lord Wolseley is not above modifying his opinion if facts show that change is necessary; and I hope that what I have said, together with remarks made by others in the discussion, will appear to him sufficient to induce him to reconsider his low estimate of the destructive power of artillery. What, however, I particularly wish to point out is, that we should ascertain practically what we can do with our various weapons, and then suit our tactics to their special purposes. Shrapnel shell, common shell with high explosive bursting charges, quick-firing and machine-guns, and magazine rifled muskets all claim to do great things, but practice *under service conditions* can alone decide their relative values and proper positions. Having ascertained these, our Generals and the troops under them may go into action with the confidence of being able to employ them to the best advantage. What

the Germans accomplished in four years, between 1866 and 1870, by the establishment of a school of gunnery, and by changing their obsolete artillery tactics to meet new conditions, shows clearly what can be done in peace-time to prepare for success in war.

There is another thing I wish to say before sitting down. Both before and after the Crimean War, pamphlets were written, one by a Russian General and the other by a British Colonel, to show that artillery had become the *principal arm*. I have had no intention of making any such claim, and repudiate the idea, as Colonel C. Brackenbury did at Aldershot, although some of those who spoke after the lecture thought that he had attempted to show that artillery could always *annihilate* any troops opposed to them. The bulk of the Army must be infantry; no position can be taken or kept without it, and infantry must, therefore, be the *principal arm*; unless, among those high explosives we hear so much about, we can discover the *vril* of the *Coming Race*, when no troops of any kind would be required. All I claim for artillery at the present time is, that if properly equipped, organized, trained, and employed, it can give very great assistance to the other arms; if—even well organized and equipped—it be badly trained and handled in action, these other arms will suffer great losses in endeavouring to accomplish their objects, besides running the risk of defeat and disaster.

Results of Practice at Okehampton in 1888 with the 12-pr. B.L. Gun.

(1.) Target,—A single line of 70 standing dummies, about 1 yard per dummy.

Range varying from 1,500 to 1,750 yards.

4 common shell to find the range, and then a group of shrapnel from each battery.

Battery. ¹	Number of shrapnel.	Number of hits.	Number of men hit.	Remarks.
1	14	131	22	} Fired with percussion fuzes.
2	14	66	16	
3	14	26	20	
4	14	31	22	
5	9	72	39	
6	11	59	25	

(2.) Target,—3 rows of standing dummies, 35 dummies in each row, 10 yards between the rows:—

¹ The numbers in this column are put to distinguish the groups of shell fired from different batteries of horse and field artillery, the letters and numbers of which are purposely omitted.

35 yards.

10

10

Range varied from 1,950 to 2,100 yards with different batteries.
4 common shell to find range, and then a group of 14 shrapnel from each battery.

Battery.	Number of hits.	Number of men hit.	Remarks.
1	83	46	} Fired with percussion fuzes.
2	110	55	
3	116	62	
4	117	53	
5	143	67	
6	111	30	
7	140	34	
8	154	48	
9	61	40	
10	330	63	
11	145	39	
12	90	29	

(3.) Target.—Scattered infantry, retreating across a ravine, represented by 45 standing dummies scattered about in twos and threes.

Range about 1,000 yards.

4 common shell to find range, then 6 shrapnel.

Battery.	Number of hits.	Number of men hit.	Remarks.
1	50	25	
2	23	17	

(4.) Target.—An irregular line of standing dummies, towards which the 3 batteries composing each detachment galloped in line about 300 yards down hill over rough heather, and then came into action at ranges varying from 300 to 450 yards. Each battery fired 15 rounds of case shot. The line of dummies was divided into 3 groups to allow the result of each battery's practice being distinguished.

Battery.	Number of dummies fired at.	Number of hits.	Number of men hit.	Remarks.
1	27	127	25	
2	25	201	25	
3	20	97	20	
4	20	27	15	
5	20	63	19	
6	20	45	18	

(5.) Target,—Battery in action represented by 6 dummy guns, and detachments of 5 dummies to each, making 30 men. The limbers were represented by canvas screens, which did not give trustworthy results, but on service the limbers might often be under cover.

Range about 1,900 yards.

12 rounds of common¹ and 12 of shrapnel shells were fired from each battery.

Battery.	Number of hits.	Number of men hit.	Remarks.
1	34	10	
2	35	14	
3	30	17	
4	13	10	1 gun detachment blown to pieces.
5	50	16	1 gun disabled.
6	56	18	" " and 1 dummy
7	15	10	blown to pieces.
8	20	12	
9	14	10	1 gun disabled.

(6.) Target,—30 standing dummies in line.

Range about 200 yards.

12 shrapnel shell from each battery, with fuzes set to burst at the muzzle.

A good instance of the destructive power of shrapnel practice was the following, the results of a group of 10 shrapnel fired at Okehampton last year.

¹ The steel common shell for the 12-pr. is so tough that it simply tears open, and is practically useless against troops, though its large bursting charge makes it very effective against earthworks, &c.

Battery.	Number of hits.	Number of men hit.	Remarks.
1	29	19	Result not good. ¹
2	13	6	
3	18	8	

Target,—A subdivision. Gun and limber, the latter represented by a canvas 6' x 6' screen; the detachment and horses being represented by 13 dummies, those for the latter not being so large as horses.

Range 2,650 yards.

Results.—147 hits on horses and detachment.

60 " the gun.
15 " the limber.

Total....222 hits.

The instances of practice at various objects given above have been taken from the records of practice carried out at Okehampton by the batteries sent there last year. The practice was arranged and the results collected by Colonel Murdoch, R.H.A., who commanded the camp, with the assistance of his orderly Officer, Lieutenant J. Headlam, R.H.A. The number of shell fired in each group was small, the object was to get as much instruction as possible out of the ammunition allowed for practice. The ranges were never measured, but found by the range-finder and trial shells; the ground is rough, with considerable differences of level between that on which gun and target respectively stand, and the weather was generally bad.

Colonel E. MARKHAM, D.A.G., R.A.: The very interesting paper which has been read by my friend General Owen is what we should have expected would have come from his pen, as we know he has studied the subject for so many years. The heading of it is, "The Value of Artillery in the Field;" but it seems to me it has rather become a historical sketch of the field artillery of this country up to the present day. He has traversed a very great deal of ground; I do not intend to follow him over the whole of it, but there are a few remarks that I wish to make. He has alluded to the mobility of the artillery, which is most important in the field, but he has not mentioned what he considers should be the proper calibre of guns for the horse and field artillery. He has, however, mentioned a 6-pounder as proposed for horse artillery. I presume he alluded to a quick-firing gun, because it follows what he has mentioned regarding quick-firing guns. In that I think he has made a mistake. Mr. Nordenfelt will correct me if I am wrong, but I believe it should be the 8-pounder quick-firing gun which is going to be tried this year at Okehampton. He also, in alluding to shell fire, said he thought there ought to be certain batteries, attached to an army corps, of field howitzers. We have also this year brought forward, and are going to try at Okehampton, some field howitzers,

¹ The unsatisfactory result was due to the shortness of the range, some of the shells bursting only just before reaching the target. Good results would doubtless have been obtained at 300 or 400 yards range.

4-25-inch bore, which will be tested against the 20-pounder guns which we tried last year, both very powerful guns. General Owen was quite right in saying that measures have been taken to try and remedy the immense recoil given to high velocity guns. We are trying a carriage now with recoil buffers: they have been tried already with the 20-pounder, and also on the field howitzer carriage. Alluding to the practice of picking up ranges, it is a very important point, and I think our instruction is keeping pace with the improvement of the gun. We draw up our rules every year, and they are revised from experience gained the year before. I must say I should like to see several Officers of other branches of the Service go down there and see the shooting; I think they would then appreciate the fire of artillery, and they would see that our artillery is not behindhand in the instruction to the Officers and men. General Owen alluded to certain Officers thinking that the artillery made a mystery of their arm, but he thinks that this idea is now exploded. I think it is so. I can assure you of this fact. Last year I went to Okehampton in company with two General Officers of infantry and several others, one a cavalryman. I believe they came away very much impressed with what they had seen of the fire of artillery. I may also mention, although it has nothing to do with this paper, that a General Officer of cavalry, who commands a district in England, attended a course of gunnery at Shoeburyness last year. I think this proves that the artillery service is not kept in the dark at all, but that we as artillerymen are only too glad to see other Officers of different branches of the Service take up the question, and come and see what artillery can do. I rather wish—but perhaps it was a little outside the limits of the lecture—that General Owen had alluded to the selection of positions for guns in action. This is a question which has cropped up lately, and is rather important, and has been under consideration; and with reference to the supply of ammunition, where the limbers should be placed. Of course we have in these cases been obliged to pick our knowledge from experience gained in foreign countries, but it would be a very difficult thing to draw a hard and fast line as to where the position of limbers should be for the supply of ammunition; it depends so much upon circumstances, upon the nature of the ground, upon when you are going into action, whether you are engaging an enemy who already holds the ground, or whether you have the advantage of selecting the position and waiting for him to attack. We have now been drawing up a new Manual of Field Artillery Exercises, in which we have considered all these questions, and also that one of keeping the limbers away when they come into action, and bringing up some of the wagons, so that when an advance is necessary you have your limber full of ammunition and ready for the work. I see, looking at the table before me, that General Owen has talked about the number of our batteries, and how inadequate they are for the defence of the country. I am happy to say that that table shortly will not prove quite correct. He puts fifteen batteries with the ammunition columns. Arrangements are now in preparation to gradually work these out, so that there will not be a necessity to convert field batteries into ammunition columns. With reference to finding men and horses in these large numbers, we find the reserve is sufficient to provide men for the first army corps to fill them up to war strength. When we have our ammunition columns arranged, and have no longer to convert batteries for that purpose, we shall find that we have a reserve of some fourteen batteries to draw upon after providing two army corps complete. No ammunition columns could be kept up in peace-time: I think that will stand to reason to everyone, for what will be their duties? You would have a lot of men and horses, maintained at great expense, practically without employment. After that we come to the militia and volunteers. General Owen says they have no field artillery. No, they have not: but they have a very large force now of guns of position. They have 104 40-pounders, 28 20-pounders, and 132 16-pounders, or 264 guns in all; and 252 of them are actually in the hands of the volunteers. They are horsed in different ways, some with farm horses and harness, and some of them have applied and have received permission to purchase artillery harness, and drive in the same way as the Royal Artillery. I have only mentioned these few points, because I am in a position to inform General Owen how they stand.

Colonel LONSDALE HALE: I rise at this early period of the discussion because I

have to go away immediately and superintend the firing of leaden artillery, and the movements of leaden soldiers elsewhere. I wish to express the hope that either the lecturer or some artillery Officer will give us some information upon one of the most important parts of the duties of artillery in the field—the value of field artillery, as it is at present, against localities, in which I of course include substantially built villages. Nobody has a firmer belief in artillery that I have myself, but what I should like this afternoon would be that some artillery Officer should give us reliable information on the subject, and I trust it will be of a reassuring character. Supposing a battery came into action in Hyde Park, and fired away at houses of the character of those built in Park Lane, what effect would that battery produce upon those houses? My friend Colonel Brackenbury has lately brought this subject of localities before the public, and he is not a more ardent believer than I am in the part that the defence of localities will take in any future war. I differ from Colonel Brackenbury, perhaps, in his view of the shelter trench part of it, but at the same time I firmly believe that the points that will be held on a battle-field will be strongly defended buildings and villages, and garrisons will never be turned out of these unless the artillery can help to do it, and do it effectively. I have been lately studying the details of the defence of the position of Faily-Noisieville, and, so far as I see, the effect of our artillery at present upon localities and upon garrisons of localities will be very much the same as the effect of the French artillery upon the Prussian garrison at Servigny. The French artillery fired shells, and set fire to the village in a few places, but with regard to the garrison, they did not care two pins about it. What we should like to know is, whether, with the artillery missiles which we possess at present, we can with a small force of artillery render a locality untenable. Supposing that locality is not made of paltry little houses, how far well-built houses can be rendered untenable either by the fire of common shell or shrapnel. I am quite aware that if you get enough guns you can knock any village to pieces if you have time to do it and have enough guns like the seventy-eight which battered Noisieville on September 1, 1870; but we have no authentic information as to the actual effect of the present shell, not the shell of the future, which is to be invented, with high explosive compounds, and so forth, but merely the shells of to-day. Can artillery Officers here undertake to turn a garrison out by firing common shell and shrapnel, provided the garrison are placed according to common sense and properly under cover? That is the point on which I hope artillery Officers will give us information this evening.

Colonel MAURICE, R.A.: I propose to restrict myself to one particular point of this most valuable and interesting lecture, that is, as to the question of moral effect as connected with the material effect of artillery, and the references which have been made to the mode in which that subject has been dealt with by three friends of my own in the other arms of the Service, the late Colonel Home, R.E., General Clerly, and Lord Wolseley. I, for one, certainly believe most surely both in the material effect which is produced by artillery, and in the enormously enhanced material effect which will be produced by artillery with our improved sights and our improved guns. But for all that, I cannot admit that it is a disparagement to our arm of the Service to say that its great feature is the extraordinary moral effect which it produces. Take any other arm of the Service: take the infantry. We are all agreed that if it were possible for the infantry habitually to fire volleys instead of engaging in individual shooting, it would be most desirable that they should do so, and it is only because volleys cannot as a rule be fired in action, that we are unfortunately obliged to abandon volleys, and to restrict ourselves chiefly to independent firing. Now the enormous difference between volley firing and independent firing is simply a difference in moral effect. The whole of that marvellous story, which has been told again and again by French writers, even better than by our own historians, of the successive victories of our troops in the Peninsula against French troops has been acknowledged again and again to prove the moral effect produced by infantry fire delivered suddenly and at a given moment. Therefore it seems to me it ought not to be looked upon as a disparagement of the efficiency for victory winning purposes of the artillery to say that the moral effect produced by artillery fire is greater in proportion than the material effect which it also produces.

The reason why that great moral effect is produced is, I think, a very simple one: it is precisely that you get out of the destruction which is produced by artillery just that effect which you would try to get, if you could, from the employment of infantry. The blow when it is struck has the sudden taking effect of a volley. The shell when it bursts effectively at all produces an appalling and tremendous effect on one spot and at a given moment. It is a very serious thing, as General Owen has said in his lecture, to see, as I have done, a couple of horses and men struck over by a single shell; it is a thing that produces an immense effect upon the minds of the men who witness it at the time. And, as it seems to me, the whole use of the arm, and its proper tactics, are determined by realizing that it is this moral effect which, if we are to win victory, we must enhance in every way. As far as I have observed myself, and I have found my observation confirmed by people who have seen far more effective artillery fire than I have, what continually happens under the fire of artillery is this: those who are exposed to it for the first time fully realize that a shell carries with it the possibility of that tremendous destructive effect of which I have spoken, and as soon as shells begin to hurtle through the air the first few rounds tend to produce an enormous moral effect. But after a little time men observe that there are a great many shells which produce no material effect, you have plenty of time to watch them, to see them down, and you see that they produce no effect, and this goes on for a long time, before the next destruction is produced by an effective shell. It is almost always soon after the beginning of artillery fire that this loss of moral effect is apt to occur, because artillery usually begins at long ranges, and because the range has not been quite so accurately found as it is later in the action. Not being at that time in danger of infantry attack the troops under artillery fire can then better than afterwards take cover from it. For various reasons of that kind the early period of artillery fire rather tends, unless it is a very concentrated artillery fire, to undo its own moral effect. You have plenty of time to watch every shot with artillery as you have not plenty of time to watch every shot that is fired from the immense mass of unaimed ineffective infantry fire. You cannot count bullets coming through the air, but where you see shells, as you may do, coming and exploding harmlessly, it tends very greatly to discount the moral effect of artillery. For my part I have always believed, and I think I am right in that opinion, and I have generally confirmed myself by comparing notes with other people, that the enormous importance to us of concentrated artillery simply depends on the great moral effect which is produced by the concentration. Because if you have an enormous number of guns operating upon a single point, and the shells bursting in the air all about you, there is no time to make the calculation as to the material effect between one shell that does strike and spread ruin and the next that does so; and, therefore, seeing that there is continually a certain amount of destructive effect, and the shells are continually coming, the shells that don't strike tend to enhance the moral effect instead of reducing it as they do when there are long intervals without effect. Therefore it seems to me of the greatest importance that we should recognize both in the use of artillery and with regard to the power and effect of the arm, that it should be so employed as to produce that which is the object of all war, which is in all cases and in relation to all arms of the Service the grand thing at which we aim, which, as Napoleon said, counts for nine parts in ten in battle, the production of moral effect. I believe, myself, that the very great increase which we are making to the future material effect of the gun will very greatly enhance that moral effect, and that any future successes will be due not merely to the material loss which will be occasioned, but because of the enhanced moral effect which the artillery will on that account produce. I want to turn to another question in connection with that, and that is the relation of artillery Officers towards the other arms of the Service, in the view which they would wish them to take of their arm. I do not for one moment believe that there is the smallest fear that Officers of other arms will underrate the effect which our own particular arm of the Service, the artillery, will produce in the next campaign. But supposing you were in command of a body of cavalry, dealing with a body of infantry, would not you wish to inspire that cavalry with a feeling that you intended so to lead them against the infantry against which they were going to be engaged, that you would never allow them to do anything

else than to go forward to victory, that never should they have to come disastrously under the killing power of infantry, but that, taking advantage of the rapidity of your movements, and the facility of your manœuvring power, with your knowledge of ground and your skill in using it, and your power of striking round the flanks of the enemy, you would always gain the victory no matter what weapon might be in their hands? And, on the other hand, if you were in command of a body of infantry, resisting that very cavalry, would not you wish to inspire that body of infantry with the feeling that if they are only able to keep command of themselves and keep steady with their weapons, they will most assuredly win? When you come to criticize these books which are written for the instruction of cavalry and infantry Officers, it is not for the advantage of the artillery any more than for the advantage of any other arm of the Service that the infantry and cavalry who are going to co-operate with us should fear the guns that are to be used against them by one of the enemies of England. It is not against them that we are going to use our guns, they are going to join us in fighting against the guns of quite another Power, and I am perfectly certain that to take the specific instances of which Colonel Hale has spoken, the feeling which actuated my friend Colonel Home in speaking mainly for cavalry and for the infantry which must be, of course, the most important arm of the Service, he had this object in view, and had no object whatever in disparaging the artillery. As a matter of fact, I may say Colonel Home's unfortunately premature death, which is one of the greatest losses the Service has had in my time, has deprived us of the enormous advantage of the successive revisions which his book would have received had he lived, and I can answer for it from my own personal knowledge that that book as it stands does not in the smallest degree represent his final views or anything that he would now be satisfied with, had he had the means of carrying out the revision which he would have wished to give to it; therefore, I may admit that there are certain things in it which I should well wish out of it, valuable as it is and instinct with his peculiar soldierly genius. In relation to the particular statement made as to General Clerly's book on "Minor Tactics," it is simply a question of fact. There is the book. It is one very familiar to most Officers, and I can only say I have this afternoon carefully gone over the chapter on the relation of the three arms of the Service, which is the one in which all these questions of artillery are mainly or entirely dealt with, and there is not a single illustration, a single instance, taken except out of the war of 1870. Colonel Hale has long since abolished for us all history prior to the war of 1870. I want to know whether all illustrations from the 1870 campaign are also to be abolished? I quite admit that we are going to have an enormous increase in the power of artillery in the future, but, for the purpose of a text-book, it is impossible to deal with other than the experience of war, and I do not think the attack is quite a fair one upon a text-book which is prepared for a certain specific purpose, and which must deal with the actual events of war, and not with the opinions which we naturally form as to the future of our own arm. Lastly, I should like to say one word about what has been said in relation to Lord Wolseley's "Pocket Book." That book was originally written when he was a Colonel of infantry in Canada, and the very passage which is quoted is directed to the particular effect which ought to be produced upon the minds of infantry who may have to face artillery in the field. I confess myself I should be very sorry to do other than inspire our infantry with the utmost confidence, and as I have urged the effect of artillery is unquestionably, from its nature, to produce a moral effect out of all proportion to its material effect, great as that material effect is, therefore, most assuredly, I should like as far as I possibly can, speaking as an artillery Officer, to discount for all our infantry Officers who have to come into action against artillery, the moral effect which the artillery of the enemy will quite sufficiently produce upon them by its material effect. I have no doubt that that was the motive with which that particular passage was introduced. A passage which originally was written by a Colonel of infantry, speaking especially to his own arm of the Service, has through successive editions become the work of the Adjutant-General of the Army, speaking to the whole Army. In that position I still say that the most important duty of a man who wants to carry forward the Army as a whole to victory is to discount as far as possible beforehand the tremendous moral effect which will be assuredly liable to be produced by the striking and

dramatically appalling effect produced by hostile artillery. There is no fear that he will shake the confidence of artillery Officers in their own arm. I can say positively that no man has more confidence in the artillery than Lord Wolseley. If I may venture to say so, in a mixed assembly of Officers like this, not once, but again and again Lord Wolseley has said to me, as he has said to others, "I do not say this because you are an artillery Officer, but because I find it so—the artillery Officers are the best Officers of the Army." Therefore I may assure you that it is not from some special prejudice against the artillery that Lord Wolseley has spoken in the way in which he has done in the "Pocket Book." He has the most complete confidence that nothing that he says will in the smallest degree shake the confidence of the artillery in their arm of the Service. The very best effect that could be produced upon the rest of the Army is to tell them to go forward against the artillery of the enemy with every possible confidence, and to discount as far as possible, by statistics or otherwise, the tremendous moral effect which the immediate and striking material effect of artillery tends to produce.¹

General Sir GERALD GRAHAM, G.C.: Not being an artilleryman I venture to add my testimony to Colonel Hale's as to the value of artillery in the field. I had not the advantage of being present at Colonel Hale's lecture at Aldershot, but I have heard him lecture at this theatre on a similar topic, and I think, on that occasion, he somewhat successfully demolished much of the statistics that are relied on to prove the inefficacy of artillery in the field. I am only sorry that he had to leave us so soon this afternoon, and did not re-enter on that subject. I can state my belief, not only in the value of artillery, but that our artillery is the finest in the world as a service, and I am happy to hear that confirmed by so high an authority as Lord Wolseley, as quoted by Colonel Maurice just now, as regards the artillery Officers. There is one point I should like to refer to, as coming from an Officer of General Owen's great experience and authority, and that is his opinion of quick-

¹ In speaking I omitted to draw attention to an obvious misunderstanding of some importance as to the phrase used on p. 121 of the last edition of the "Soldier's Pocket Book." "In previous editions of this 'Pocket Book' I have laid stress upon the fact that the effect of artillery fire is more moral than actual, and I trust that these figures will make the Army, especially the infantry, fully recognize the truth of that assertion, and put a stop to the cry for more guns which one still hears occasionally." The last phrase has I find been supposed to imply that Lord Wolseley is content with the fact that we have hitherto had no guns for the home Army, volunteers, and militia at all. This is purely a misreading of the text, which simply objects to an increase in the proportion of guns in the field beyond the 3.75 per 1,000 men which Lord Wolseley has elsewhere spoken of as a maximum. As a matter of fact no one has represented our deficiencies in respect of the home Army more strongly than Lord Wolseley. I was, when Colonel Scott came in, on the point of saying that we also owe entirely to Lord Wolseley what all artillery Officers now recognize as at least one of the most important improvements in our time of the artillery arm—Scott's sights. I may add that from the point of view maintained in my speech, no evidence subsequent to the War of 1870, as to the future material effect of artillery in war, affects the argument. If the victory winning effect of artillery due to its moral effect was so great, as we know it to have been at Sedan, where the Emperor declared that he surrendered to the artillery, the whole question is whether *in that war* the material effect was such as with any other arm would have produced that moral effect. If not, for heaven's sake let our infantry and cavalry know and understand that fact. They will need all their knowledge of it, and all their national phlegm to resist the moral effect of the appalling material effect which artillery will produce in the next war. The technical phrase that it is the duty of artillery "to prepare the way for attack" means that it is their duty so to shake the nerves of the defenders that they may succumb to attack. Ought artillery Officers to wish that their own Army should be prepared beforehand to succumb by cramming down their throats all possible evidence as to the reality of the danger, or should they wish rather that the Army should know that, bad as it looks and is, it looks worse than it is.

firing guns. He says: "I cannot see how they could be used to any extent in the field, as they require to be fired continuously from the same position without recoil." I should be glad to hear from General Owen why the fact of their being fired continuously, without recoil, should make them of no use, or of little use in the field. I should have thought, on the contrary, it would have enhanced their value in the field. General Owen says: "I have often thought that our field carriages might be improved by having recoil slides, or some arrangement for lessening recoil. If the recoil could be prevented, both the accuracy and rapidity of firing would be increased, the labour of running up would be avoided," and so on. It appears to me that General Owen there recognizes the value of non-recoil carriages, and, therefore, I cannot quite understand the first part of the paragraph. General Owen also says, "They might, as their advocates say, fire a greater weight of metal in a given time; but I think that is a fallacious comparison." That is with reference to the small calibre of the 6-pounder gun. Colonel Markham has already observed it is an 8-pounder gun, but I wish to inquire why the above should be called a "fallacious comparison." I should have thought that for a light gun to be able to fire a greater weight of metal in a given time than a heavy gun would be an enormous advantage. Referring to the subsequent remark of the lecturer on the great importance of lightness and the long marches performed by artillery quoted from Prince Kraft, the enormous importance is obvious of having light guns, and everyone who has seen any service will recognize that as a most important factor in the gun. Those who were in Egypt will remember that the 13-pounder we had there, though a most valuable gun, was too heavy for the sand of the desert, and could not be brought out and made full use of on account of its weight. A light gun that will throw an equal weight of metal and produce a greater intensity of fire must have an enormous advantage over the heavy gun, even although each individual round may not produce the same effect. The 6-pounder referred to may be fired at the rate of 40 rounds a minute, which is a very great intensity of fire, and it is a very light gun. Reference is made to the Maxim as being merely a machine-gun. Of course General Owen is aware that there is a light shell-firing Maxim, a 37-millimetre gun, that fires 300, and has fired 400 rounds a minute. There you have a light machine-gun where you have the advantage of seeing the range, and, therefore, there would no longer be the same objection made to it that there is to other machine-guns where you could not observe the effect at a long range like 3,000 yards. The reference to the mitrailleuse is, I think, somewhat misleading at the present day. At that time the tactics of machine-guns were not understood, they were employed against artillery at long ranges, and, of course, entirely failed. It is very remarkable that they should have been able to hold their own against artillery on any occasion, as stated by the lecturer, as it is not intended to use machine-guns against artillery at long ranges; in fact, they should replace infantry, as they may replace long-range infantry fire, but can never be intended to replace artillery fire. There is one point on which I quite agree with General Owen, with reference to the quick-firing guns, that great care would have to be exercised to prevent the quick firing being indulged in too often or too long a time, in consequence of the running out of ammunition. That is perfectly true, and the same objection applied to the development of the muzzle-loading rifle into the breech-loader, and replacing the breech-loader by a magazine rifle. It is a question of fire discipline and training. I think with our artillery we have less to fear from lack of fire discipline than we have with our infantry; the training is higher, and there is not the same difficulty in restraining a gun detachment as there is in restraining infantry in action. It is a matter of nerve, and a gun has no nerves. In my humble opinion all these new introductions are an advantage to us who, as a nation, I believe have better nerves than most other nations. Our men want nothing but training, and the better developed weapon put in their hands will be turned to better account by the British soldier than by the soldiers of more excitable nations, since the greater control is required over the nerves for the arms of the present day. So that the objection to quick-firing guns, that they will tend to waste of ammunition, I think does not apply, assuming, as the lecturer does, that they will be used on both sides, which will always be to our advantage. This leads to the question of the supply of ammunition—one of the most im-

portant questions of the day. I do not know that the lecturer has attempted to solve it, but he has mentioned several very important points on which I shall be very glad to hear the opinions of artillery Officers. They have already been referred to to some extent in regard to placing the wagons in line, and to taking nothing out of the limbers before emptying the wagons. I feel very much reassured by the remarks made by the Deputy Adjutant-General of Royal Artillery. It is a great relief to us to know that so much is being done to improve the organization of the Royal Artillery, more especially with reference to what he has said as to the ammunition columns.

Captain F. G. STONE: I only wish to make a very few remarks, first with regard to what General Owen said with reference to placing the bursting charge of the shrapnel in the head instead of in the base. To the best of my belief the object, or at all events the result, of placing the bursting charge in the head of the shrapnel, is not principally to secure a few additional bullets, but to ensure the quicker ignition of the bursting charge, the result being that it has become possible to use percussion shrapnel with remarkably good effect, in fact with equally good effect as time shrapnel up to ranges of about 2,000 yards on ordinary ground. This, I think, is a most enormous gain in the power of artillery fire, and it is not by any means merely a question of having a few more bullets in the shrapnel. With regard to the bad execution done by the mitrailleuse in the war of 1870, in the first place it was due to the fact of the weapon being extremely clumsy, and secondly, because the Officers and men did not understand technically or tactically the nature of their weapon. With regard to Major Hutton's remark at Aldershot, which General Owen has quoted, referring to the Nordenfelt machine-gun in Egypt, that their firing was very erratic, Major Hutton pointed out the reason for the indifferent practice by saying that they were not firing *from a level platform*. Of course no gun, whether a 40-pounder gun firing shell or a machine-gun firing bullets, would be expected to fire correctly unless its wheels were on a level platform or a compensating sight was used. I venture to think the objection is not to the gun in that case, but rather to the utter absence of training which appeared in the gun detachment. It is mere A B C to any recruit in the artillery that the wheels must be on the same level in order to shoot accurately, and that if the platform be not level, compensation must be given by means of the sights; unless men are properly trained in the use of their gun you cannot expect the gun to work of itself.

Captain SALTWATER, R.H.A.: General Owen asked me a few days ago to give a few examples of the effect of artillery practice at Okehampton. In 1887, with the two 20-pounders which I commanded there, we fired a quarter of an hour at a range of 2,100 yards at targets to represent a regiment of cavalry in quarter column, and we put 2,000 bullets into the targets. Four guns afterwards, I believe, put from 3,000 to 4,000 bullets into the same targets. With regard to what Colonel Hale said as to the destructive effect of shell, I may mention the effect of firing with a 20-pounder common shell with a percussion fuze on the block-house down there was wonderful. The block-house was constructed of two rows of timber from 6 to 8 inches in diameter with from 6 to 7 feet of earth between. The first shell from the 20-pounder passed through the first row of timber, burst in the earth inside, and completely opened the second stockade behind the timber, making an enormous breach in the block-house. There was something more than moral effect in that, as you can imagine. Then, again, as to what Sir Gerald Graham said about our guns being too heavy. The lighter nature of guns, I think the 13-pounder and the 9-pounder, in 1887 made no effect whatever on this block-house, or nothing to signify. I mention this as showing the great advantage in some circumstances of having heavier field guns. One can imagine what the effect of shell of this kind would be in village fighting, where the church or the factory, obstinately held by the enemy, would be completely demolished by the shells of this new gun. As regards accuracy of practice, I may mention our competitive practice in 1888 with the 12-pounder B.L.R. gun. Two out of ten men struck a 6-foot square target at 1,500 yards twice out of three times, and several other men struck it once. If this can be done we may hope that they would be able to strike a machine-gun at that range before the machine-gun could do them any very great injury. When speaking of the practice of artillery against masonry, Colonel Hale

would like to know what effect it would have. I do not think it would be very hard to have masonry erected at Okehampton; it would be exceedingly interesting to see the effect of the different projectiles thereon, especially as in any European war there is a good deal of fighting done in and about villages which are frequently the turning points of actions. There is one point which has not been noticed, and that is the effect that the use of signalling should have on artillery fire. Commanding Officers frequently train one or two of their men to signal, but we have no authorized signallers in the batteries of our artillery. I think there should be an establishment of two or three signallers in batteries of field artillery; they ought to be paid as such, and their status should be recognized just the same as it is in the cavalry. Last year we trained two signallers in my battery, and I think the practice was decidedly affected by the fact that the observing party and the Commanding Officer could communicate thereby with facility.

Mr. NORDBENFELT: The paper is so full of interesting and suggestive matter that we should take up a week were we to discuss it fully. I want just to emphasize the exceeding necessity of the rearrangement of the Shoeburyness Establishment. I have done so once before last year in this room. In France, the Marine Artillery, only for marine purposes, has an establishment of sixteen Officers, who are working from morning till night. We, in England, have for both weapons—Army and Navy—an establishment where, I believe, there are three artillery Officers, exceptionally clever men, altogether overworked, who have not only to carry out these experiments for us but also to test ammunition and do all sorts of things which no one human being can possibly do, and which they do their best to do. Surely, instead of spending 20,000*l.* a-year on experiments and getting a blowing-up in the House of Commons, if you spend 200,000*l.* I believe they would thank you for it. In France, I believe, they spend about 300,000*l.* on the Marine Artillery alone. The question of small calibre guns as against large calibre is exceedingly interesting, and I hope when the 8-pounder quick-firing gun comes to trial we shall have some very interesting results. Prince Kraft von Hohenlohe gives 3,800 yards as the range at which shrapnel commences to have effect, and from 1,500 to 2,000 yards as the period at which shrapnel is decisive. There is not the slightest doubt that quick-firing guns, be they 6- or 8-pounders, are fully effective up to 3,800 yards, when they have a decent initial velocity. I do not mean to say they have the same effect as 12-pounders at the longest range; I do not say that they have the same effect against buildings, but I should like to see the effect of fifteen 8-pounder shots a minute containing mélinite against two per minute of the field-gun. I do not think there will be much difference on the whole. Colonel Maurice spoke of the suddenness of effect. I am working with a range-finder in which, up to 4,000 yards, we have an average fault of about $\frac{1}{2}$ per cent. That means, I can send up a range-finder beforehand, I can take a distance 2,000 or 3,000 yards away; the enemy does not see that process; I can then get up the battery or quick-firing guns, open fire for a minute or so at a range which I know within $\frac{1}{2}$ per cent., say that it is 4,000 yards—the fault would be 20 yards—I can fire a minute fifteen or thirty rounds and gallop off again. I cannot imagine any moral effect and also material effect greater than would be produced by firing five times as many shells per minute, although each shell is only 8 lbs. as against 12 lbs. You cannot look out for these shells, they come over you as a mass of fire. I believe that it was mass-fire that Lord Wolseley meant when he asked Mr. Maxim whether he could make a machine-gun to fire lead bullets at a long range. Mr. Maxim made one $\frac{1}{4}$ -inch calibre. Since the O'303 gives such excellent results for the distance at which shrapnel is supposed to be decisive, personally I do not believe it is necessary to go to any other calibre, but with the range-finder when I can stand here, knowing my range, fire for a minute or two, then gallop to another point from which I also know the range by having taken it at the previous firing point, unlimber, fire another minute again, and then repeat the same somewhere else, each time knowing the distance, I am perfectly certain the result would be worth studying. I would like to say one word in all kindness. One of the remarks General Owen has put forward is that Major Mecham, at Aldershot, does not believe in the fire of machine-guns. Major Mecham forgot in his report to mention the comparative time of fire. The machine-gun fired, I believe, for one and a half minutes, the

infantry fired for twenty minutes. Besides, I am not quite certain that a musketry instructor, clever and intelligent though he be, is altogether absolutely unbiased as between rifles and other arms. I do not want to say a word against Major Mechem, he is a clever and experienced Officer, but he is a musketry instructor. I want to say one word more about the quick-firing gun and machine-guns, and it is this: the new powders we are getting are absolutely smokeless; that is to say, the man who fires can see through the haze, but the enemy, if they are a mile away, see only the bluish haze and cannot see the man who fires. These powders are also practically noiseless, at 100 yards or 200 yards from the gun you hear a noise, but no noise of any kind is heard 1,000 or 1,500 yards away. That means that if I have found my range and fire for a minute, I am almost satisfied that quick-firing guns or machine-guns will have the required effect before the field gun is actually ready to commence to fire.

Lieutenant-Colonel SCOTT, R.E.: General Owen has given us a very clear and interesting lecture on the value of artillery force in the field, in the hopes of convincing unbelievers in its efficacy; but if he thinks that they will be convinced by words alone he is much more sanguine than I am; I have already tried that game. To be convinced, they must go and witness with their own eyes the terrible effect of modern artillery fire on the practice ranges at Okehampton, which privilege I have myself enjoyed by the courtesy of the Royal Artillery, for several years, and then they will change their opinions as did a very distinguished General Officer who, to the great satisfaction of the Royal Artillery, honoured the camp last summer with his presence. The knowledge to be gained there, of the effect of artillery fire, of the modifying effect of ground upon the effect of that fire, and of the tactical principles to be learnt therefrom, the General above referred to would tell you, is of the highest importance to every Officer in the Army, whether he be a commander or leader of men in the field. Every Officer who has completed his course at the Staff College should be ordered to Okehampton instead of to Aldershot to learn artillery work. No Officer who has a chance of becoming a commander of troops will in these days be fit for such an important post who (as the lecturer has well said) has not thoroughly mastered the technical and tactical value of each arm, whether it be a field-gun, Maxim gun, quick-firing gun, or rifle; for his gauge of the effect of fire of each of these arms creates in his own mind the principles on which he is to base his tactics, and if his ideas are theoretical on this subject, his tactics will also be theoretical, and will result in an unnecessary sacrifice of the lives of his own men. There is only one way of acquiring the above most indispensable knowledge, and that is to go and see these guns fired, and to note their destructive effects. There seems to be present in the minds of some that the field-gun may be supplanted by one of the new arms, such as a Maxim gun or small calibre quick-firing gun. Now I am not one of those who think that either of them can take the place of the other. We want them all, and as many of them as possible. They each have an independent rôle to play, and it is our business to find out by actual practice what that rôle is, so that we may intelligently combine their forces together to the best advantage, under different phases of the fight. If it comes to a comparison between the value of the Maxim machine-gun and the 12-pounder field-gun, as an engine of war, there is no question in my own mind that the field-gun has the palm. The field-gun, with its shrapnel containing 177 bullets, its case containing 216 or more bullets, its common shell and fragments, can create against troops in the open as deadly a danger zone of bullets at 4,000 yards as the Maxim gun can at 1,500 or 2,000, if the effect of its fire can be observed, and it can attack troops behind cover with effect with its shrapnel and common shell which the machine-gun cannot; and at close ranges it can fire its case with 216 bullets with deadly effect up to 300 yards. How often has it happened that the infantry could not penetrate into a village or house till the artillery had come up to their assistance. With a view to convincing any unbelievers in the value of artillery fire, I would remind them that when a shrapnel is burst at the proper distance from troops in the open, the cone of dispersion of shrapnel containing 177 bullets creates a danger zone on level ground of 440 yards long by 26 yards broad at 1,000 yards; of 330 yards long by 20 yards broad at 2,000 yards; and of 160 yards long by 13 yards broad at 4,000 yards, and that, contrary to the machine-gun fire, the fire

of the danger zone is more intense at the longer ranges than at the shorter range, because the 177 bullets of the shrapnel fall into a smaller space. No, gentlemen, artillery fire is no joke in these days. The hole made by a shot is no longer the safest place to put your head into in these days on land. I do not know whether this practice still obtains in the Navy. The 12-pounder shoots like a rifle, and, in fact, shoots where it is laid. You won't believe me, perhaps, when I tell you that you can hit a gun in about three shots at 3,000 yards, and that shots frequently go through the same hole. With the slow-firing howitzer, I have myself seen at Shoeburyness three shots go through the same hole at 2,400 yards, and if that can be done with a howitzer, the slow travelling shot of which is more influenced of course by the air than that of a high velocity 12-pounder gun, then it can easily be done by the high velocity 12-pounder. There is another point which General Owen mentioned with reference to a battery first coming into action, and then finding the range. I think so highly of the effect of artillery fire, that I do not believe a battery could come into action against another battery already in action without being annihilated; and, therefore, I think it is absolutely necessary that the ranges should be found first of all by range-finder, or by a section of guns, and the sights adjusted under cover, the gun loaded and the fuze set, before going into action. Of course there are difficulties at present about having the gun loaded, but I believe that it could easily be got over with a little thought; also you want the fuze to be in the base of the shell which can be altered after the gun has been loaded. There is another point, that is with reference to the lecturer's remarks on the value which Lord Wolseley is said to put on artillery. I venture to think that his lordship's impressions on that point were very similar to those held by a large number of artillery Officers themselves, previous to the important improvements which have recently been introduced into the training of the Officers and men in shooting, and I am sure no one in England would be more pleased than his lordship to learn that the artillery fire had so much improved, and that the artillery intends to maintain the proud position for efficiency which it has always held in the British Army. Perhaps you are not aware that it was entirely due to Lord Wolseley's influence that the sights which General Owen has been good enough to refer to in his lecture were tried by batteries of field artillery, and if they have met with your approval, it is his lordship that you have to thank for their introduction into the Service.

Major HUTTON, King's Royal Rifles: My remarks made at Aldershot, to which General Owen has alluded, were intended to convey the idea, and, I think, they did in the discussion which followed the lecture, that the machine-gun which we have had an opportunity of testing up to the present moment is not a perfect weapon, and not that machine-guns are not extremely valuable adjuncts to an army in the field. The experiments conducted at Aldershot under the superintendence of Major Meham, to whom Mr. Nordenfelt referred, were conducted with very great care, and, as far as possible, under service conditions, and the result certainly surprised every one. General Owen has alluded in his lecture to the result of the experimental practice which then took place. The reason that the shooting was so bad we considered to arise from the fact that the sights and mechanism of the guns under trial were defective. The question of the principle of the employment of machine-guns with troops did not come into the question at all, but as practical soldiers we considered that the machine-gun submitted for trial was not a perfect one. I do not think there can be any differences of opinion as to the extreme value of the machine-guns in war, firstly, at short ranges, and, secondly, at long ranges. It is simply a question whether at long ranges the machine-gun is a sufficiently perfect and finished weapon for its purpose. I venture to think that at the present moment it is not so. Some very remarkable experiments took place at Aldershot the other day, which illustrated or brought home to us one of the manifest defects of the machine-gun at long ranges. The new magazine rifle was fired at 2,500 yards by a party of ninety infantry soldiers at a vertical and horizontal target with the most extraordinarily successful results. The target was not seen by the men at the firing point, as it was a very foggy day, but they directed their aim at an intermediate point at 1,000 yards distance, but here lies the secret of the successful shooting; the direction of every volley, and the mistakes

made in the aim, were made known accurately at the firing point by means of the telegraph, and therefore the necessary readjustment of sights was made, and thus it was that the shooting was so extremely accurate. Bear in mind that with a machine-gun you have no means of seeing where the bullets strike, and therefore unless you have a very carefully contrived range-finder, your machine-gun may be pumping lead and exhausting the ammunition limbers to no purpose whatever. Again, the laying of the gun and the sighting must be of the most perfect and complete kind if useful practice is to be reckoned upon at long ranges.

Lieutenant-General Sir ROBERT HUME: I wish as an old infantry Officer to say a few words to tell General Owen how exceedingly interested I have been in his lecture, and also because I do not think any infantry Officers have spoken this evening. The subject of the lecture is of the greatest interest to us, more so perhaps than to artillery Officers, who naturally know so much more about the subject than we do, but it is certainly of quite as much as great interest to us as it can be to them. I have never in the course of my service heard so many observations made in, I may say, depreciation of the artillery as I have heard this evening, I mean that the opinion seems to be pretty general that in other branches of the Service the artillery is not appreciated. But that is not at all the fact. There is no branch of the Service that any of us, I think, are more proud of altogether than our artillery, and I am perfectly certain that any of us, either infantrymen or cavalrymen, would be very sorry indeed to have to depend upon ourselves and to be left without artillery. As for the moral effect of artillery, I do not think, so long as the artillery produces the effect that we wish it to do, that it matters whether it is moral or whether it is actual. I do not know whether there are any other Officers in the room who can remember one instance of the very overwhelming effect of artillery that we saw in the Crimea, I mean at the Alma, when we were going up the hill. There were three shells fired from Turner's battery into what seemed to us an enormous mass of Russians who were coming down the hill, but the effect of those three shells dropped into this mass, whether it was moral or whether it was actual I do not know, was that the mass moved up the hill, and the effect on our men was that they went faster up the hill after that mass than they had done before. That happened when I was a young subaltern, and of course a few things of that sort in the way of practice have a very great effect on one's mind. I know that any of us who served out there, and actually saw the effect, and felt the effect of artillery, have never doubted the value of artillery since those days, and we teach, as far as we can, our men of different branches of the Service what they are to expect from the assistance and also from the opposition of artillery. With reference to what the lecturer said as regards Officers as far as possible being instructed or going down to see experiments with artillery at Shoeburyness or wherever they may be, I think that the different branches of the Service should, as far as possible, whenever opportunity offers, be made acquainted with the arms and with the training of the other branches. In India, where I served a long time, we have many of those opportunities which you cannot have in England, because we are able to carry out our own artillery practice, and our rifle practice near our large stations where any man, it does not matter whether he be a General Officer or one of the privates, infantry or cavalry, can go to the range, and many do go to the range, and see the effect of the practice. With regard to another observation made about artillery Officers making a mystery of their guns, and what they have to do, I can only say in my experience, and I have had a good deal, I have never seen it. I have found the greatest anxiety, not only to show everybody what they have to do, but to get men of other branches of the Service to go and see what they are doing, and the greatest pride taken in showing what they can do. I am delighted to hear all that has been said to-day about the progress the artillery is making, because so much depends upon it, and I feel personally very much obliged to the lecturer for the lecture he has given us, and the opportunity of the discussion. To many of us who are not actively employed, this Institution is the only place where we can hear these subjects properly discussed.

Captain F. E. D. ACLAND: I shall not detain the meeting for more than a few moments, but as an old Shoeburyness Officer, and having spent over four years in experimental work, I should like to say a word or two in regard to what General

Owen said. Firstly as to firing guns on what I think he called "perfectly level ground." As an experimentalist, I am convinced that it is the only way to arrive at any true results whatever with machine-guns or other artillery matériel; and to arrive at any reliable conclusion as to the comparative accuracy of any weapon, every outside cause of possible inaccuracy must first be carefully eliminated. After the weapons have passed through the experimental stage they should of course be handed over to the troops to experiment with them in what is technically known as "under service conditions." I know what an experiment under service conditions means, because I have carried out many in that way myself; but I fear that it often means that insufficient care for details is bestowed on it, and, even if the care is given, the Officer who has charge of the experiment does not fully grasp all those points of detail which are matters of ordinary routine to a man with a regular experimental training. For instance, Major Hutton has just fallen into a trap, in which I must catch him. He has told you that with the new rifle and the new ammunition they fired with most wonderful results at 2,500 yards, and that they had the effect of their fire and so on telegraphed down to the firing point, and then immediately, in the next sentence, he says that with the machine-gun you cannot see the result of your fire, and so how can you expect to get effective shooting at these long ranges? The logical conclusion would be to put the machine-gun on a footing similar to the rifle, and establish the telegraph, and then you have a fair comparison between the two. After an enormous amount of trouble in various quarters they have at last arrived at an ammunition for the new rifle, but as far as I know there is no machine-gun built at the present moment which has ever fired that ammunition. If you want to compare your rifle and machine-gun fire, put them on an equal footing in this respect and fire similar ammunition, and so see which is the most accurate. I must also go back to a remark made by Mr. Nordenfelt as to the experimental establishments of this country. Since I have left the Service it has been my privilege to see the experimental departments of two of the larger European countries, Austria and Russia. I had always, as a true Britisher, expected to find Russia a benighted country, but I must own, to my shame, that though I found the Officers less well educated and less well up in what one might call European gunnery, yet their experimental establishment was certainly double if not treble as good as our own at Shoeburyness. Their instruments were perfect, and if money was wanted and the experimental Officers said that they must have certain things they seemed to get them. The experiments were carried out by a staff of sailors and soldiers, not of soldiers only for naval experiments, but of soldiers and sailors, each doing their own proper work, and doing it in a way which was a source of astonishment to me. In Austria it is much the same thing: each have their own experimental ranges and establishments. Now I am perfectly intimate with all the details of Shoeburyness work, and I say it is monstrous that in this country, with all its wealth, we should be left with one questionably complete experimental establishment, inferior, as far as I can judge from a week's visit to one place and a fortnight to the other, in almost every respect to those in Austria and in Russia.¹

General OWEN: I shall trouble you with very few remarks in reply. The object of the lecture was to elicit information from others rather than to attempt to instruct anybody here. I wanted to hear the observations of those interested in the various points raised. Colonel Markham said that my paper dealt rather with the history than the value of field artillery, but I think the discussion we have had will hardly bear out that criticism. I saw Mr. Nordenfelt the other day, and he was good enough to tell me there was an 8-pounder besides the 6-pounder. If it is an 8-pounder so much the better; but I understood Mr. Nordenfelt to recommend the 6-pounder. Colonel Markham said that I had not pointed out the best places for limbers and wagons in action, but it might be inferred

¹ I am perfectly well aware of the experimental establishment connected with the "Excellent," but it must from local disadvantages remain lamentably deficient in all that can make it a satisfactory place for scientific research into general gunnery questions, which is vital to the correct solution of those many problems connected with matériel before it is introduced into the Naval Service.

from what I did say, that these should be in rear of the intervals between the guns, out of sight, and under cover when possible. As to the introduction of field howitzers and taking steps to avoid the necessity of turning fifteen field batteries into ammunition columns, I shall be extremely glad to hear if both can be accomplished; but the 20-pounder lately tried at Okehampton is not a howitzer in any way. The guns supplied for the reserve forces are very useful, but they are mostly position guns, which would in no way be able to take the place of field-guns. It is not necessary for me to answer what Colonel Hale said; Captain Saltmarsh replied very effectively. I do not think there is much doubt that buildings or strong masonry of any kind would be damaged very considerably by our guns. Colonel Maurice put very ably the contention respecting the moral effect of artillery, but I cannot at all agree with him that the moral effect is *out of all proportion* to the actual effect. However, it is not worth while saying anything more about that point, but I may say this: Colonel Home's book on "Tactics," although written a long time ago, is still used. Then again with regard to Lord Wolsley's "Pocket Book,"—I did not quote the edition he published twenty years ago, but the eighth edition. Sir Gerald Graham took exception to what I said about continuously—continuously fired from the same position without recoil. What I say is, you cannot fire a gun continuously that you have to lay between the rounds; *you* cannot fire a hundred rounds continuously if you have to lay your gun between each round. I am not speaking of the Maxim but the quick-firing guns, and I understood, both from the Armstrong firm and from Mr. Nordenfelt, that the firing of each round put out the laying to a certain extent; that although the recoil carriage prevented any running back, and there was only a slight motion, still there was sufficient to put out the laying.

MR. NORDENFELT: The vibration of the weapon is sufficient to disturb the aim at 2,000 or 3,000 yards; therefore they should always be relaid. But the relaying is done by wheels, and we still fire from fifteen to eighteen rounds comfortably per minute by relaying each round.

General OWEN: I am glad to hear that so much can be done.

Captain F. E. D. ACLAND: Twelve aimed rounds per minute is the condition the Government laid down, so that you can lay twelve rounds a minute.

General OWEN: Captain Stone said the reason for having the bursting charge of shrapnel in the head was that it enabled the shell to be fired with a percussion fuze. I am not quite sure I understood him, but if that is the case, it is an advantage, of course; still I cannot think that the shell is altogether satisfactory, and when I wrote to Colonel Barlow, R.A., Superintendent of the Royal Laboratory, to ask the reason, he replied, "Having the bursting charge in the head leaves room for more bullets."

Captain STONE: I said that putting the charge in the head enabled the bursting charge to be ignited with greater rapidity than when it was in the base, and that therefore percussion shrapnel would take effect under the new conditions with great results up to 2,000 yards; whereas in the old condition, that is, when the fuze took so long to ignite the bursting charge, owing to the latter being in the base, the bullets went up in the air instead of travelling forward. This is due to the fact that in the former case, the burst is almost instantaneous upon impact, and actually takes place at the moment when the effect of the ricochet has brought the axis of the shell into a horizontal position, or with its point perhaps just on the rise from that position; the axis of the cone of dispersion is consequently horizontal or slightly inclined upwards, thus giving great effect to the bullets. In the latter case, however, the action of ricochet is completed before the burst has time to take place, the result being that the axis of the cone of dispersion is deflected upwards to such an extent, that there is practically a safety zone of 50 to 100 yards immediately in front of the point of impact, most of the bullets falling harmlessly over the object aimed at.

General OWEN: Mr. Nordenfelt said the powder they used would make very little noise and no smoke, but a kind of haze, which would be rather an obstruction in the way of those aiming from a distance. That of course is an advantage, and I referred to it in my paper. As to my alluding to a fallacious comparison in counting the amount of metal fired from two guns, I say this, if you have a

6-pounder shell fired against a 12-pounder shell, for instance, the smaller shell, I should imagine, would fire too close, and the cone of dispersion would not be of the same extent. You may fire the same weight, but you would not cover the same ground—that is my meaning. I do not think it is necessary to detain you any longer.

The CHAIRMAN (Sir Lintorn Simmons): I think you will all agree with me, in fact all the speakers hitherto have expressed their opinions that they have been much gratified by the lecture we have just heard from General Owen. It has brought sundry subjects under our notice which are of great interest to the Services. They are so numerous that it will not be possible for me to touch upon many of them, but there are one or two as to which I will make a few observations. The lecturer in the first instance began by combating a statement by Lord Wolseley, that the effect of artillery is more moral than actual, and that it kills but few. I have heard a great deal about moral effects as distinguished from actual effects, but my belief is that the moral follows the actual results, and that noise will not frighten properly organized troops, such as an army might be likely to meet in Europe, but that they are effected solely and wholly by the results that are to be seen among them. There is a certain effect of noise which gives confidence to troops, as when their own artillery is heard in their vicinity, because it assures them that they are supported on their flank, where they know that destructive results are being produced upon the enemy. The effect of the noise of artillery in the field is not like that produced upon a household when a burglar is in the house, who may be suspected of having a revolver in his pocket. Individuals are liable to alarms of that sort, but I do not believe that large masses of men, if well trained, well organized, and subject to discipline, can be affected in that way. What really brings crushing effects in war is when troops having been weakened by disease, by heavy marches, by want of food, or by previous disasters, find they are suffering heavy losses; great moral effects are then produced, and when so fatigued and worn out that they are unable to maintain their ground. These, I believe, are the principal causes why troops retire from the field of battle; but I do not believe in the moral effect of noise at all. The question of quick-firing guns is one of the greatest possible interest. I heard Captain Acland remark that the conditions fixed by the Government for quick-firing guns were that they should be able to fire twelve laid rounds in a minute. That is, I presume, for sea service; and I can perfectly understand such to be the case, because at sea guns are fixed upon standards when they do not recoil at all, which is not the condition of guns which must be subject to recoil or shock when fired in the field. I take it the conditions are quite different. Having seen practice on board ship, I have not the slightest doubt that these guns can be fired twelve rounds in a minute, the gun being in a fixed stable position, and the man who lays the gun never removing his shoulder from its butt.

Captain ACLAND: If the field-gun does not recoil, surely the guns are in the same condition as those on board ship?

The CHAIRMAN: But in the field the gun is not fired from a fixed platform.

Captain ACLAND: The gun will not recoil.

The CHAIRMAN: On board ship the gun is absolutely fixed, and the platform to which the gun is attached is fixed; whereas in the field there must be a certain amount of motion from the shock on the ground. I have not seen these guns at work in the field, but I cannot understand that there is no motion whatever on the ground.

Mr. NORDENFELT: We have often fired eighteen rounds from a field carriage—often.

The CHAIRMAN: Laid?

Mr. NORDENFELT: Yes, often.

The CHAIRMAN: I am glad to hear it, but I do not understand it, I must say, that is, if the gun be carefully laid after each round. Then as to the effect of shrapnel in the field. I have not seen any of these new pattern shrapnel with bursting charges in their head, but having been on the Armstrong and Whitworth Committee, which is now perhaps almost too out of date to allude to, I know that shrapnel shells of those days, as fitted by General Boxer, had the charges in the

base of the shell, and that a great number of rounds were fired direct at walls 18 or 20 inches thick, and against earthworks, when we found that the shells with those percussion fuzes exploded immediately behind the obstacle, as they came out of it, within a couple of feet or so. The results, as recorded, show that they would have had the most destructive effect upon men inside the walls. In order to test the action of the fuzes, which was very quick, shells were fired against targets of wood 2 inches thick, after passing through which, they burst about 15 feet behind them, at least that was the conclusion that was arrived at after a number of experiments carefully conducted. That seems a very quick explosion, and certainly the bullets were not impeded by it, which they must be, more or less, by the explosion of the charge in the head of the shell. I have no further observations to make. These have occurred to me within the last few minutes, and I now ask you to pass a vote of thanks to General Owen for his exceedingly interesting lecture.

Friday, February 15, 1889.

ADMIRAL SIR EDWARD G. FANSHAWE, G.C.B., Vice-President,
in the Chair.

THE MORE RECENT IMPROVEMENTS IN THE THORNYCROFT TORPEDO-BOATS.

By JOHN DONALDSON, M. Inst. C.E.

In the early days of torpedo warfare the ordinary steam-launch, converted into a torpedo-boat by being fitted with a spar torpedo, formed a ready and, in the hands of men of enterprise and resource, a most efficient means of offence, and did considerable service in the American and Russo-Turkish wars, and more recently in the war between Chili and Peru. The speed of these boats was not great, yet, such was the panic produced on board the vessels attacked, that the casualties on board the boats were small as compared with the results obtained.

The tactics were those of surprise, in which speed was of less importance in the attack than in the subsequent escape, should the attack prove unsuccessful; and these tactics were continued after the advent of the fast torpedo-boat, which was considered simply as an improvement on the earlier steam-launch, and was armed with either the towing or the spar torpedo.

The towing torpedo was found unsuitable as an armament for the small fast vessels of that period, and soon gave place to the spar, with which weapon most of the vessels built by my firm previous to 1878 were armed.

The introduction of the machine-gun as an armament for ironclads, however, rendered the immediate neighbourhood of one of these vessels almost if not quite unapproachable, and many people thought and some said that the days of the fast torpedo-boat were numbered, and that anything which could be done by them could be done equally well by an ordinary steam-launch as in the days of yore.

This idea was brought very forcibly home to the professional mind by the remarkable diagrams illustrating Captain (now Admiral) Hopkins's report in 1880 on the competitive trials between Nordenfelt and Hotchkiss machine-guns, and showing the disastrous effect of employing these weapons against models of second-class torpedo-boats.

The non-professional mind was greatly assisted in the same direc-

tion by a picture which I understand the late Mr. Hotchkiss had painted about that time, showing the repulse by a French ironclad armed with Hotchkiss guns of a number of torpedo-boats which had attacked her (Plate 4).

A photograph of this picture is on the table.

With the introduction of the Whitehead torpedo as an armament the future of the torpedo-boat seemed to take a fresh departure, it being no longer necessary to go close up to the vessel attacked, from three to four hundred yards being considered near enough for successful practice, and large numbers of vessels fitted with the means of discharging this weapon were ordered by the various Governments, the smaller vessels designated by the English Admiralty second-class boats being fitted with various devices, such as side frames, dropping gear, steam impulse gear, and, ultimately, ejecting tubes suited for air impulse, and the larger, or first-class boats, being fitted with air impulse ejecting tubes.

The earlier first-class boats built for the English Admiralty had a single swivelling tube on the forward deck, and the torpedo could be fired without stopping the way of the vessel, a matter of great importance in combating the machine-guns, and it is noteworthy that England was the first to adopt the swivelling gun, which in various forms is now being adopted abroad.

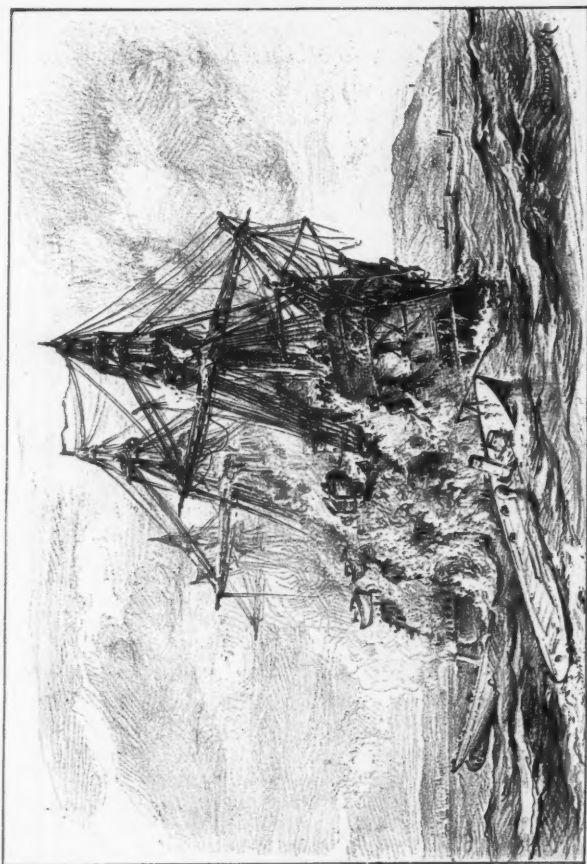
The models A and B on the table represent the typical boats of the English Navy in 1881, when I last had the honour of lecturing in this room, A being a first-class boat of the period with its swivelling tube forward and reserve torpedoes in carriages amidships, and B being a second-class boat with torpedoes in side frames, one ready for discharging and the other in the stowed position.

The immense advance which has been made in these boats is shown by the models C and D, the former of which represents a first-class boat recently designed by us to suit the Admiralty requirements and to embody all our most recent improvements, and the latter a second-class boat, designed under similar conditions.

With the exception of the very early vessels built by us in which the propeller was abaft the rudder, our torpedo-boats previous to 1886 were, as a rule, fitted like ordinary vessels with the rudder abaft the propeller, and depended for their steering going astern, and a certain amount of increase of turning power going ahead, upon balanced rudders placed forward, which were so arranged that they might be raised or lowered at the discretion of the commander, and if necessity required might be dropped altogether.

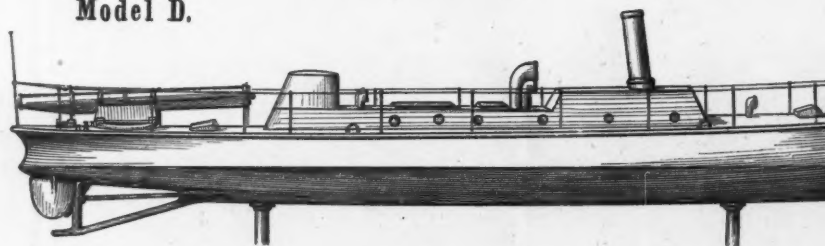
The rudders forward were not by any means satisfactory, although they increased the manœuvring power of the boats, partly because the arrangements for working them simultaneously with the after-rudder were somewhat complicated, and partly because they so readily caught up floating obstructions such as nets, ropes, &c. On the second-class boats they were somewhat dangerous if suddenly put over when the boat was rolling in a sea-way, and were discontinued in these boats on that account.

In 1886 we completed two small boats for the Admiralty, numbered

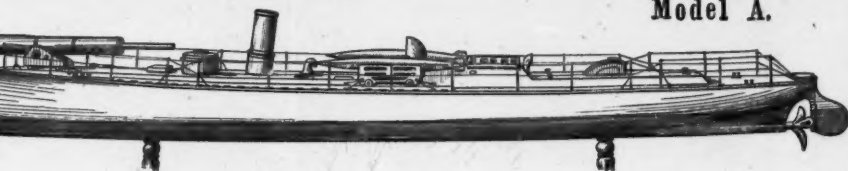


FRENCH IRONCLAD ATTACKED BY TORPEDO BOATS.

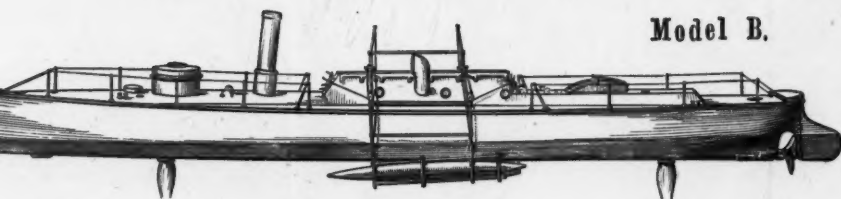
Model D.



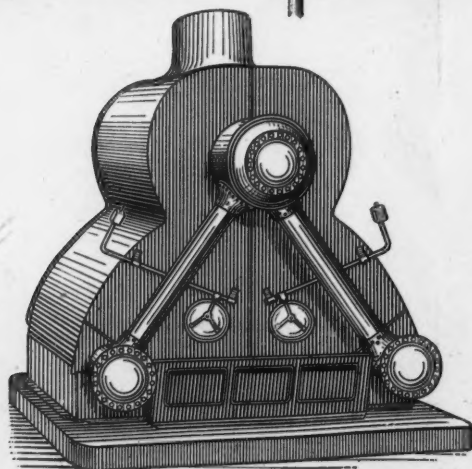
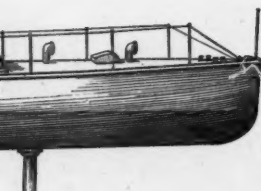
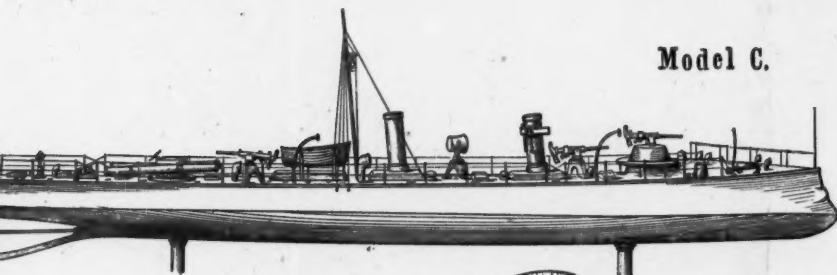
Model A.



Model B.



Model C.



MODEL OF THORNYCROFT BOILER.

respectively 99 and 100, second-class boats, in which the rudder question was completely solved by the adoption of our patent system of double rudders.

These rudders, as may be seen in Diagram No. 1 (Plate 5), which illustrates No. 100 second-class boat, and in model E which represents a design for a guard boat for submarine mines, are placed one on each side of the propeller, and, as may be readily imagined, cause the whole volume, or nearly the whole volume, of water from the propeller to be deflected to one side or the other, according to the position of the rudders and to the direction in which the engines are working, whether ahead or astern.

In order to decrease the lateral resistance and to secure as much as possible of the turning effect of the volume of water from the propeller, the dead wood is cut away as shown, a device probably as old as navigation, and together with the prototype of balanced rudder may be seen any day on board the large country boats on the Hooghly.

Like every invention of any value, the double rudders took a good deal of working out, but their value was so distinct in Nos. 99 and 100, that the twenty-five first-class boats ordered from us by the Admiralty were fitted in this way, as were all subsequent vessels to which the system was applicable. The stems of the rudders were fitted with quadrants into which screws, carried on a spindle between them, were geared. This spindle, in the case of second-class boats, had a pitch pulley fixed at one end to take a pitch chain worked from the steering wheel, and in the case of first-class boats was worked direct by means of a steam steering engine lying between the rudder stems.

Nos. 99 and 100 were of the same dimensions, viz., 64 feet in length by 8 feet beam, and drew 3 feet 7 inches of water. Both were fitted with "Whitehead" ejecting tubes in the bow, suited for powder impulse.

No. 99 had an ordinary locomotive boiler, and No. 100 had the "Thornycroft" patent tubulous boiler hereafter to be described, which, occupying less space, gave more room for the stowage of men with small-arms, a considerable space forward of the boiler, as may be seen from the diagram, in addition to the after-well being available for their accommodation.

The displacements of these vessels were as nearly as possible the same, viz., $13\frac{1}{2}$ tons, but the speed, owing to the extra horse-power obtained through the employment of the patent tubulous boiler, differed considerably, being 16.13 knots in the case of No. 99, and 16.8 knots in the case of No. 100.

Both boats showed a marked superiority over the ordinary second-class boats in manœuvring power, the circles being completed in an average of 44 seconds to starboard and $46\frac{1}{2}$ seconds to port, with a diameter of 49 yards, while the ordinary second-class boats took $85\frac{1}{2}$ seconds to starboard and 60 seconds to port, with a diameter of circle of 94 yards.

A very remarkable feature of these turning experiments was the

fact that in going astern the circles were completed in less time than when going ahead, viz., $43\frac{1}{2}$ seconds to starboard and 40 seconds to port, results which will be appreciated by Officers engaged in handling these fast boats, as with the facility with which the engines can be stopped and started, almost anything can be done in the way of manœuvring by a man with a little experience and a clear head.

With regard to the other improvement with which these boats were fitted, viz., the tubulous boiler, I may say that previous to 1860 my partner, Mr. Thornycroft, had gone thoroughly into the boiler question, and had thought out everything that was possible in the way of compact, light, and powerful boilers, and in his first fast steam-launch, the "Ariel," built in 1863, had adopted the locomotive type as that most likely to meet all the requirements of a fast steam-launch.

This was the boiler of the "Miranda," and of all fast boats built by us, whether for torpedo-boats or for the fast pleasure launches on which the reputation of my firm was originally founded, and I think I may fairly claim that we were the first to use the locomotive boiler as a marine boiler.

As time went on, however, and greater demands were made for steam, without any possible concession in the way of weight, which, be it remembered, had all to be floated, the locomotive boiler with its straight tubes and tube joints in close proximity to a fierce fire showed signs of distress.

Tubes leaked, and that persistently, priming occurred to an extent that frequently baffled all our efforts to continue a trial, and in a way that was most puzzling. Sometimes we could run with a high wind pressure, such as in some boats which I delivered to the French Government at Cherbourg, in which we used a pressure equal to 10 inches of water, and at other times we could not use 2 or 3 inches without priming.

Skill also in the working of the boilers was a great consideration, and an experienced stoker made a wonderful difference in a trial trip, not only in the keeping of steam, but in ensuring that the ordinary difficulties might not be greatly enhanced by the addition of a boiler explosion.

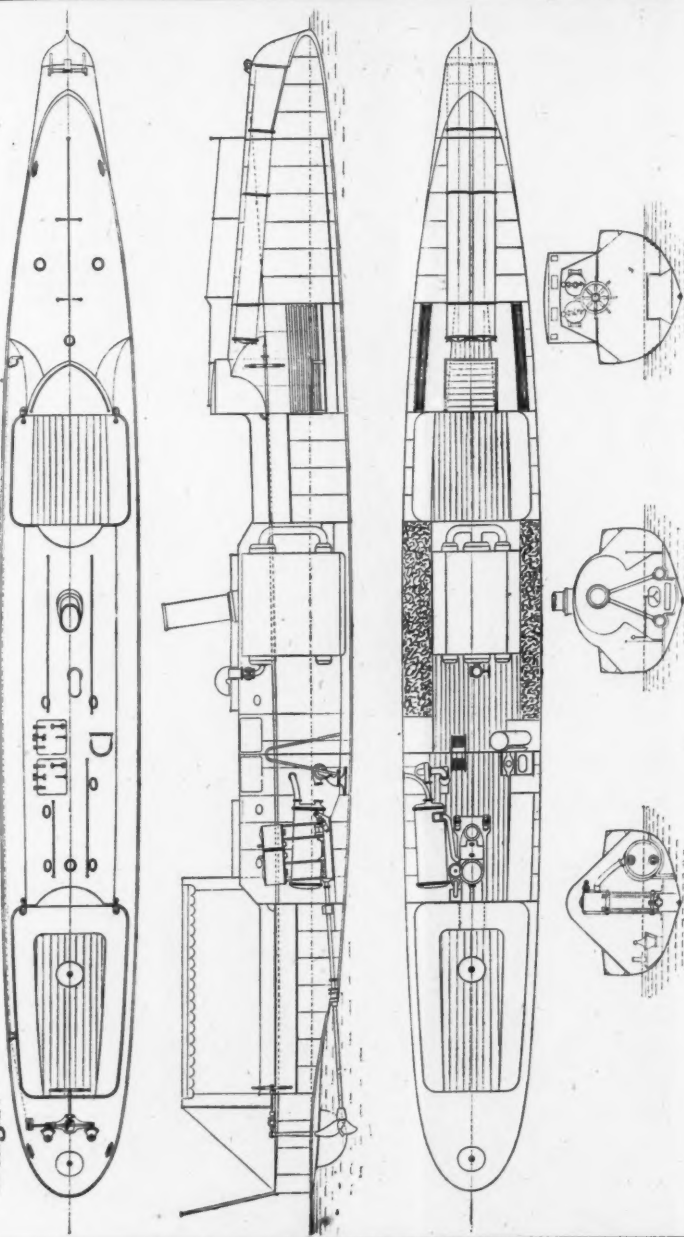
I am thankful to say that in our own hands no such explosion has ever occurred, but I regret to have to add that after some boats left our hands the nearest approach to an explosion which the design and construction of the boilers admitted had taken place, through the ignorance of the people working the boilers, with most disastrous effect.

Many attempts have been made to produce high pressure steam in tubulous boilers, that is to say, in boilers in which the water is inside the tubes in contradistinction to those in which the water is outside the tubes, notably in the case of the "Perkins" boiler, and more recently in that of the "Herreschoff" and "Du Temple" boilers.

The "Perkins" boiler has not been tried in a torpedo-boat, but the "Herreschoff" has, both in this country and in America.

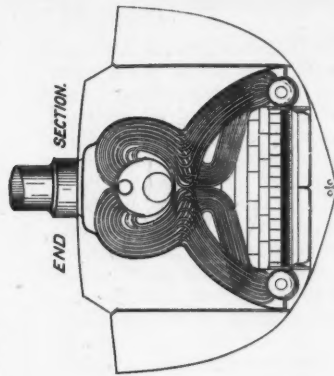
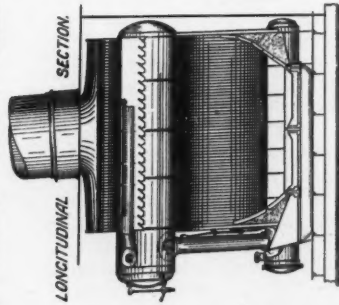
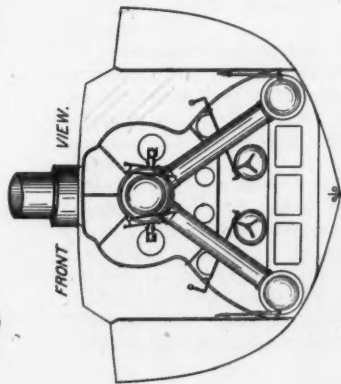
The results in this country were to a certain extent satisfactory, but

Diag. I.
2nd CLASS TORPEDO BOAT FOR THE ENGLISH GOVERNMENT.

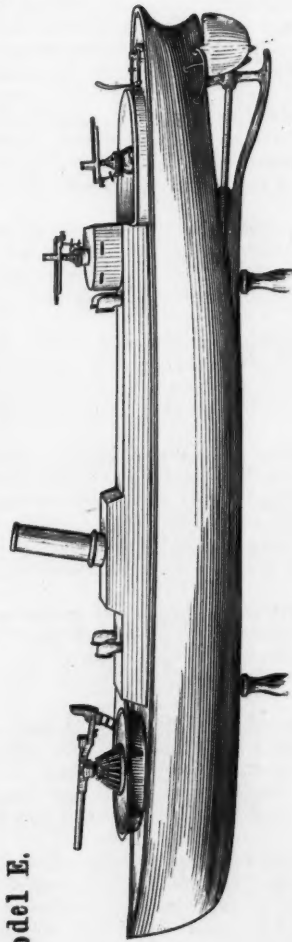


Diag 2.

THORNYCROFT PATENT WATER TUBE BOILER.



Model E.



it is noteworthy that since 1883, when the last boats fitted in this way were delivered to the Admiralty, no others have been ordered. They are still manufactured in America, however, by the Messrs. Herreschoff.

The "Du Temple" boiler has been used a good deal in France for steam-launches, and latterly, I believe, for torpedo-boats.

At first sight it appears to be not unlike the "Thornycroft" boiler in its leading particulars, so much so that its inventor, M. Du Temple, considers the "Thornycroft" boiler to be simply a piracy of his invention, and nothing apparently will persuade him to the contrary. The points of difference, however, are clear, and are just those which contribute to the success of the "Thornycroft" boiler as a torpedo-boat boiler.

The first "Thornycroft" boiler was fitted to the steamer "Peace," built by us for the Baptist Missionary Society in 1883, for service on the Congo.

It was the result of much careful experiment, and although well adapted for the particular service for which it was designed, was in many ways not quite suited for torpedo-boat work.

Its lasting properties, however, have had a five years' test, and on the 18th of September last, Mr. Grenfell, the missionary in charge of the boat, reports as follows:—

"The boiler itself is doing splendidly, and we have no difficulty in keeping up steam sufficient for 400 revolutions—in fact, quite steam enough for any purpose, and when head to wind often too much."

The torpedo-boat type of tubulous boiler is shown on Diagram No. 2, but is perhaps best illustrated by the model on the table.

It will be seen to consist simply of three cylinders lying parallel to each other, the two smaller being at the base of the structure, and the larger one at the top.

These cylinders are rigidly connected by means of two large tubes at the fire-door end, by which the water returns from the upper to the lower cylinders by two stays at the outer end, and by the lower cylinders being firmly fixed to the seatings attached to the floors of the boat.

A further connection exists between the top and bottom cylinders in the great multitude of small tubes curiously but methodically contorted, the ends of which are firmly fixed in the top halves of the lower and upper cylinders.

These are the steam generating tubes, and are perfectly free to move under the influence of expansion or contraction caused by differences of temperature or of pressure.

On looking carefully it will be noticed that the inner row of tubes forming what would be the crown of the fire-box, and the outer row forming what would be the shell in an ordinary boiler, are, by means of a very simple alternation of their ends, made to lie quite close together, so that none of the products of combustion can pass between them. The lower part of the upper cylinder is thus protected from the direct action of the heat, and none of the products of combustion can reach the outer casing.

The tubes are fixed in the cylinders by expanding in the ordinary way, and an outer casing of thin steel covers the whole.

In the upper half of the upper cylinder a curved baffle-plate with serrated edges is fixed to protect the steam pipe and allow of the quiet separation of the water and steam.

The fire-bars are disposed at the base of the boiler, and between the two lower cylinders, and have a fire-brick framework all round them, the end portions of which protect the outer casings where there are no tubes, and the side portions act as protectors to the lower cylinders, and as bridges over which the flame must pass on its way to the chimney.

When steam is required the boiler is filled with water up to the middle of the upper cylinder, and the fire is lighted.

The products of combustion pass over the side bridges and through the spaces between the lower ends of the generating tubes into the spaces between the tubes and along them to the upper half of the upper cylinder, whence they are drawn off to the chimney.

In addition to the heat absorbed from the gases a great amount of radiated heat is received by the tubes forming the crown of the furnace.

As may readily be imagined, in consequence of this large access of heat, the whole of the water and steam in the generating tubes is ejected violently into the upper cylinder and thrown on the top of the separator plate, whence the water is conducted gently to the water-level, the steam being drawn from the underside of the baffle-plate by means of a perforated internal pipe.

The water returns to the lower cylinders by means of the return tubes in front, thence to be drawn up as before through the steam generating tubes.

From this it will be seen that a most energetic circulation obtains in this boiler, and as the steam and water are both thrown into the upper cylinder the effect of a large water surface is obtained, and priming is completely obviated.

This circulation and the general action of the boiler are best illustrated by the small working model I have had made for this purpose.

The upper cylinder is represented by the open vessel on the top, the downcast tubes by the pipe leading from it to the lower vessel, and the generating tubes by the bent tubes with their upper orifices opening into the upper vessel.

On applying heat to the generating tubes the water and steam at once begin to boil over, the steam passing off, and the water returning along the return tubes to the lower vessel.

From the description of this boiler which I have given it will be seen:—

1st. That great structural rigidity is combined with ample elasticity in the tubes exposed to the action of the heat.

2nd. That no joints are exposed to the direct action of the fire.

3rd. That owing to the tubes forming the fire-box being close

together, a greater amount of surface exposed to the radiant heat of the fire is secured than usually obtains in a tubulous boiler.

4th. That from the tubes forming the outer surface being close together, no heat from the gases can come through, and the radiation from the boiler is only that due to the temperature of the steam.

5th. That on account of the great amount of heating surface and the small amount of forced draught required, the products of combustion have a very large proportion of the heat taken out of them, and no hot ashes or flames escape from the chimney, as is frequently the case with the locomotive boiler.

It has been urged against the boiler that as the generating tubes are very thin, they will be more readily destroyed by corrosion than the tubes of the locomotive boiler. This may be so if they are neglected, but if properly kept clean and dry I think there is little danger from this source.

Should a tube become leaky, it can be easily stopped at both ends by means of stoppers which we supply for this purpose, one of which is now on the table, and these stoppers, if once inserted, will become firmly fixed in their places, as the pressure will always be greater in the cylinders than in a leaky tube.

The loss of heating surface in one tube, or in even a dozen, is so small in proportion to the total surface, that no great loss of efficiency will be experienced if a good number be stopped up.

Should it be necessary to renew any of the tubes, there is no difficulty in doing so. All that is required is to remove a few of the surrounding tubes, an operation of no great difficulty, and one which we have done without removing the boiler from the boat on several occasions, when a defective tube has shown itself under the water test.

The work is done by means of a ratchet brace and the tool which I hold in my hand. This tool is inserted in the end of the tube so that the collar on the tool rests against the end of the tube, the ratchet brace is then applied, and the tube is gently but forcibly displaced, and the tubes are so little injured by this process that they may be replaced after the defective tube has been got at and remedied.

Since the component parts of the boiler are all of a moderate size and the tubes can be thus easily taken out and replaced, it follows that a ship fitted with these boilers could have them removed and refitted without disturbing armoured decks and other permanent parts of her structure.

Indeed it is a question whether a ship fitted with ordinary boilers could not have them cut out below and sent up in pieces, new tubulous boilers being sent down in pieces and put together.

There is this to be said on that question, however, that vessels fitted with ordinary boilers would probably have ordinary engines not fitted to deal economically with the higher pressures of steam for which these boilers are so well suited.

I find from our records that the missionary steamer "Peace" was completed towards the end of 1882, and tried on the Thames, was then taken to pieces, packed, and sent to the Congo.

On this occasion all the tubes were taken out of the boiler, as the weight of each package was, as far as possible, restricted to 64 lbs.

The vessel and its boiler were re-erected there by the missionary and his black assistants, and set to work in the spring of 1884, since which time it has been running with the success already mentioned.

No. 100 second-class torpedo-boat was running on the Thames early in 1886, and was delivered to the Admiralty in August of that year, so that the boiler has been in use altogether something like three years, and by the latest accounts was giving continued satisfaction.

These facts tell strongly in favour of the boiler, and their evidence is corroborated by a letter I have received from Captain Nielsen, Director of Naval Construction of the Royal Danish Navy, in which he says:—

“In the torpedo-boats ordered during the last two years from your firm for the Danish Navy, you will remember the boilers are of ‘Thornycroft’ patent tubulous type, thus two tubulous boilers have been fitted in each of the first-class torpedo-boats ‘Narhvalen,’ ‘Havhesten,’ ‘Storen,’ and ‘Soloven,’ and one boiler in each of the four second-class torpedo-boats and four patrol boats.

“These boilers have up to this date never given any trouble, steam can be put up in less than half an hour without risking leakage by sudden variation in temperature.

“They are splendid steam generators, the air pressure at full speed does not exceed 1 inch to $1\frac{1}{2}$ inch in the large boats.

“The engines can be stopped suddenly from full speed with heavy fires on without any consequent difficulty as to sudden rise in steam pressure, and, on the other hand, the steam pressure can be raised 100 lbs. in a few minutes, yet it has never happened that leakage at any tube or joint has appeared. The boiler is not liable to priming, and the water surface is not disturbed, or the heating surface uncovered by the rolling of the boat.

“Besides these advantages with regard to the general working and management on cruise, the tubulous boiler possesses other important advantages.

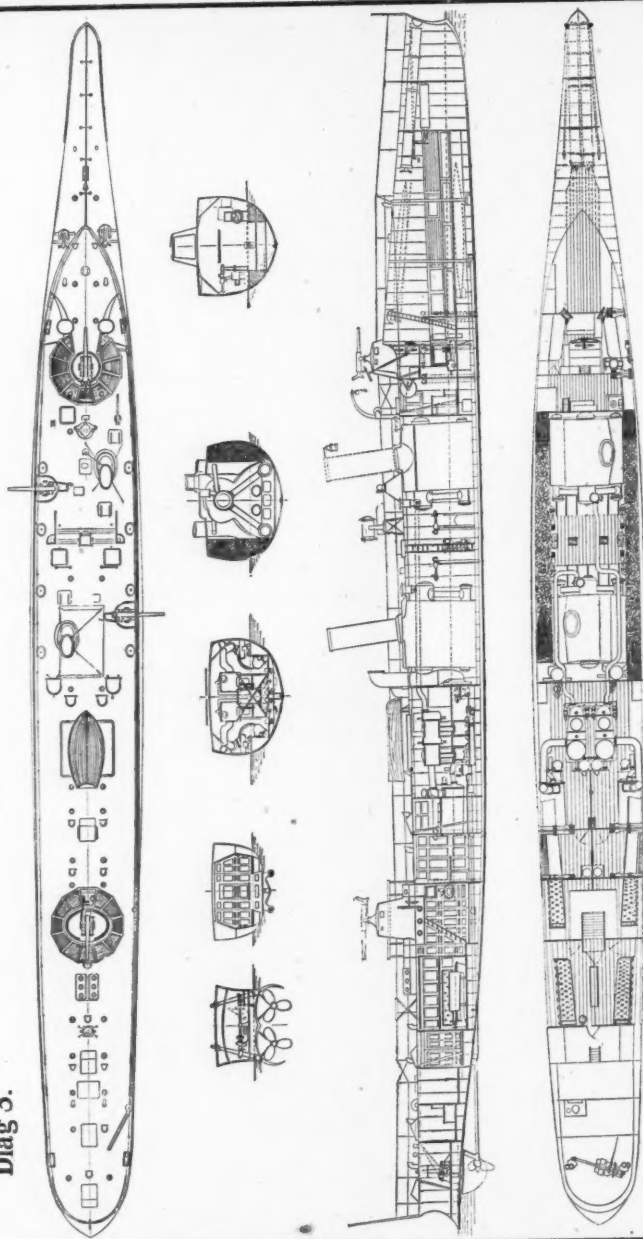
“Thus it is well adapted for high pressure, the boiler having no flat surfaces stays can be done away with. The combined weight of the boiler proper with its content of water is considerably less than is the case with the locomotive boiler.

“Considered as a war-ship, the advantages which a torpedo-boat with two tubulous boilers, each able to drive the boat at a high speed, possesses over a similar boat fitted with one large locomotive boiler are evident. Having a large and very effective heating surface, the boiler is very economical as to coal consumption, nearly all the heat developed by combustion is given off by the gases before they enter the funnel, and no unburned coal escapes from the funnel, which point speaks largely in favour of this boiler for torpedo-boats’ purposes. Our engineers are, in fact, so satisfied of their superiority over the locomotive boiler that we, without hesitation, fit these boilers in all new boats, and when locomotive boilers in older boats have to

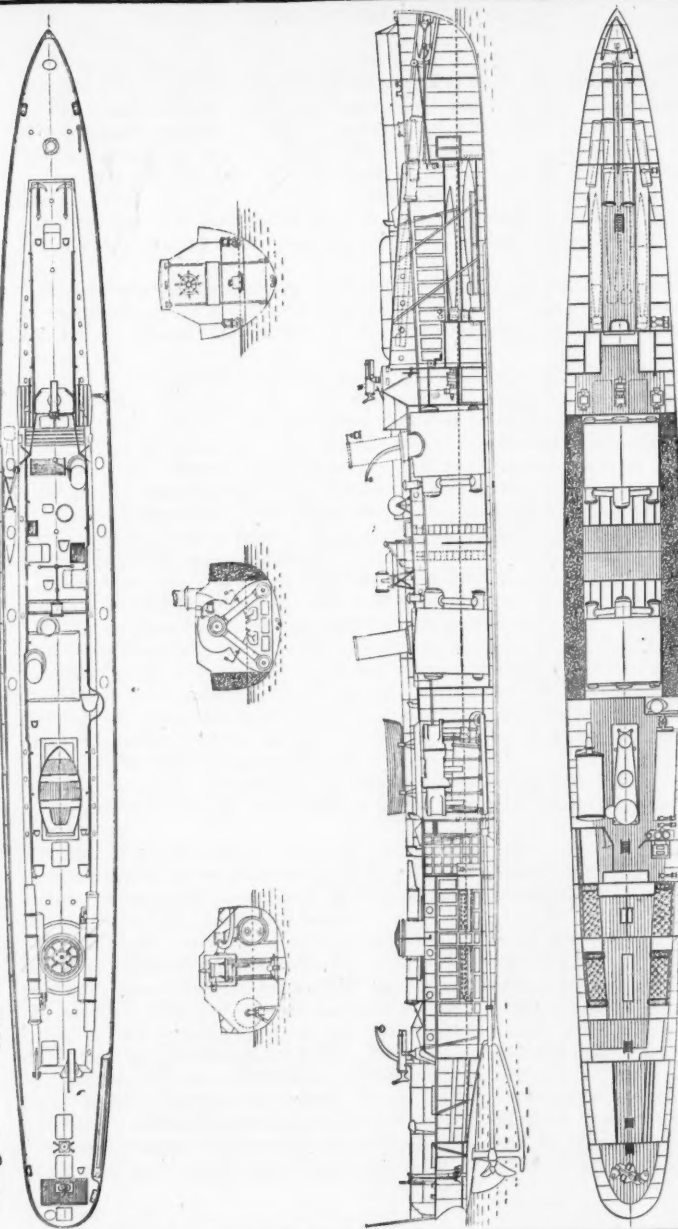
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THE "ARIETE" FIRST CLASS TORPEDO BOAT.

Diag 3.



Diag 4 **GENERAL ARRANGEMENT OF 1ST CLASS TORPEDO BOAT FOR THE DANISH GOVERNMENT**



be taken out for repairs, we replace them with the tubulous boiler, as now done in the 'Delfinen.'

I will now direct your attention to Diagram No. 3 (Plate 6), which represents the Spanish torpedo-vessels "Ariete" and "Rayo" and the French vessel "Coureur."

These vessels are 147 feet 6 inches long by 14 feet 6 inches beam, with a displacement of 98·75 tons on a draught of water of only 4 feet 11 inches.

In appearance they resemble somewhat the twenty-five first-class sea-going torpedo-boats built by us for the Admiralty in 1886.

The snouts, however, are wider, as they carry two torpedo-guns forward instead of one.

The general features of the accommodation are much the same as on all torpedo-boats, the crews being berthed forward in the torpedo-room and the Officers aft.

In the larger vessels the cabins are somewhat roomier, and in some cases advantage is taken of the increased space to provide separate sleeping cabins for the Officers.

This is the case in the "Ariete" type, as may be seen from the diagram, where two cabins are provided forward of the saloon for the Commander and his Lieutenant, and two abaft the engines for the engineers.

The great feature, however, in "Ariete" and in all our recent vessels fitted with double rudders is the great expanse of floor surface which is secured in the after cabins through the form of the stern. This is seen very clearly from the diagrams. The torpedo armament of these vessels consists, as previously mentioned, of two torpedo-tubes in the bow, and they have in addition four 3-pounder quick-firing guns, one on each turret and one on each side. Four torpedoes were carried, and in the case of "Coureur" 3 tons of gun ammunition.

Instead of being fitted in the usual way with one propeller only, "Ariete" and her sister ships had twin screws driven by ordinary compound engines which developed collectively about 1,550 I.H.P.

The boilers are our patent tubulous type worked up to 150 lbs. per square inch, one boiler supplying each engine with steam.

The guaranteed speeds in all these vessels were 25 knots on the measured mile and 24 knots on a run of two hours' duration.

On their official trials "Ariete" did 26·003 knots on the measured mile and 24·9 knots on the two hours' run, "Rayo" 25·52 knots on the measured mile and 24·63 knots on the two hours' run, while "Coureur," which was tried at Cherbourg, from some cause which I have been unable to discover, only did 23·5 knots on the measured mile and 23·6 knots on the two hours' run.

On her preliminary trials on the Thames, a speed of just over 26 knots was obtained with a load of 7·8 tons on board, a result which quite warranted us in expecting our guaranteed speed at Cherbourg, more especially as there was an ample supply of steam, and the engines would be freer in working after steaming all the way to Cherbourg.

I attribute the loss in speed to either the propellers not being

exactly the same as in "Ariete" and "Rayo," or to the rudders not being set to the correct angle, a matter of considerable importance with side rudders, or possibly to both causes combined.

The Minister of Marine declined to accede to our request for an additional delay to enable us to find out, remedy the defect, and have a fresh trial, as he was anxious to send the vessel from Cherbourg to Toulon in rough weather, so as thoroughly to test her sea-going qualities. He, however, allowed us to send our engineer Mr. Brown round in her to Toulon, and from his log we have got much valuable information as to her behaviour at sea.

One experience they had which I believe is not uncommon with an engine-room crew new to a ship, and that was the large consumption of coal as compared with the results obtained in our coal consumption trials.

Our contract in this respect was that the coal consumption should not exceed 85 kilogrammes of coal per hour at a speed of 10 knots, which is equivalent to 8.36 tons per 1,000 knots, and on the trials at Cherbourg, the exact amount required, as determined by a trial of six hours' duration, was $7\frac{1}{2}$ tons. The total distance run from Cherbourg to Toulon was 1,968 knots divided into three portions, viz., from Cherbourg to Brest, 205 knots; from Brest to Cadiz, 943 knots; and from Cadiz to Toulon, 820 knots.

During the first two stages the fuel consisted of Briquettes, and during the third stage common Welsh coal, procured at Cadiz, was used.

The stoking, at first indifferent, improved as the voyage progressed, the results being, that during the first stage 1 ton of Briquettes carried the ship 50.24 miles, which gives 19.82 tons per 1,000 miles; during the second stage, 54.2 miles, or 18.45 tons per 1,000 miles; while during the third stage, probably owing to the inferior quality of the fuel, 1 ton of the Welsh coal carried her only 44.07 miles, or 22.7 tons per 1,000 miles.

During the later stage the Commander ordered full speed for half-an-hour with one engine only, which gave a speed of $17\frac{1}{2}$ knots, a result which pleased him greatly, because, as he said, "the boat was at sea in sea-going trim and with her own crew."

On the voyage "Coureur" proved herself an excellent sea-boat, and the Commander, according to Mr. Brown, was loud in his praises of her manœuvring qualities.

Since the arrival of "Coureur" at Toulon we have received a letter from Admiral Krantz, Minister of Marine, which has given us much gratification, the translation of which is as follows:—

"I am pleased to acknowledge that from the reports which have come to me, the 'Coureur' appears to have given every satisfaction in respect of her sea-going qualities during her voyage from Cherbourg to Toulon. The working of her evaporative apparatus has been equally most satisfactory, notwithstanding that the utilization of the fuel may not have been maintained to the same advantage as it had been on the trials."

Diagram No. 4 illustrates a type of vessel of which we have built

two in the autumn of last year for the Government of Denmark. The dimensions are: length, 137 feet 10 inches; beam, 14 feet; draught of water, 7 feet. The general arrangement, with the exception perhaps of the cabin accommodation, differs considerably from that of "Coureur."

The stem is straight, or nearly so, above the water, and is continued by a large easy curve to the keel, while the bows are considerably flared out, the object being to give an easy entrance, so that the boat may be more easily driven over booms or other obstructions, and at the same time to render the boats more seaworthy and drier than sharper boats, which allow the spray to run up their sides and spread over the forward deck.

The forward tubes are very snugly encased in the bow, their ends being some considerable distance inboard, so as to avoid any projection which by throwing up spray would betray the position of the boat under the electric light at night.

The doors for the egress of the torpedoes form part of the skin of the ship when closed, and by a very simple arrangement open inwards when required.

The sterns of these vessels are of the form rendered necessary by our system of double rudders:—the outer end of the propeller shaft being carried by a strong bracket, to the lower end of which is attached a bar, connecting it with the keel of the vessel.

As may be seen from the section through the stern on Diagram No. 4, the combination of double rudders and this bar forms an admirable protection to the screw against floating obstructions, such as ropes, nets, &c., and I may mention in this connection that during the Danish manœuvres conducted last year, one part of their defence against torpedo-boats was a 2½-inch steel hawser fitted with cork floats, so as to have a surplus buoyancy of 8 lbs. per fathom.

Torpedo-boats of the ordinary type were easily caught and "hung up" by this device, but Captain Caroc, who was in charge of the torpedo-boats, drove one of these protected boats of ours fourteen times over this hawser at various angles without being caught.

The machinery on the Danish boats consists of a set of triple compound engines supplied with steam at 200 lbs. pressure per square inch by two of our patent tubulous boilers. The armament consists of two torpedo-tubes in the bow and two revolving tubes on a turret aft.

Instead of being arranged at an angle with each other, so as to give several angles of fire, as in the English first-class boats, these tubes, as may be seen from the diagram, were fitted parallel to each other, and arranged with the muzzles at alternate ends, so that one gun can be fired to port and one to starboard, but both guns cannot be fired from the same broadside without training the second gun round after the first has been fired. This, I think, is rather a disadvantage.

Besides the torpedo armament, a five-barrel Hotchkiss revolving cannon is fixed on the top of the forward conning-tower, and a similar one on the deck aft.

The contract speed of these vessels was 22½ knots with a load of

10 tons on board on a run of three hours' duration, and $21\frac{1}{2}$ knots with 20 tons on board, but otherwise under the same conditions.

On the trial a speed of 22.66 knots was obtained under the first-named condition, and 21.53 knots under the second. The displacement of the vessels was about 100 tons on the full load trial, and the I.H.P. 1,270.

The circles were completed on an average of 80 seconds to starboard and 80 seconds to port.

In these vessels the Danish Government was anxious to secure a combination of high speed and great seaworthiness.

The first of these qualities was thoroughly tested in the estuary of the Thames before the vessels left this country, and the latter was tested after their arrival in Denmark by their being sent out during the months of November and December, as Captain Caroc expresses it, "with the intention of trying the boats in hard weather," a condition which they seem to have had no difficulty in securing at that time, with the result, as reported by Captain Hovgaard, who was in command, that "the new boats are able to keep the sea anywhere in our waters, even in the more open parts, such as the Baltic and the Skager-rack, for any length of time which their store of coal and water will permit."

Further on he writes: "We have tested the boats in heavy weather at high speed, and find that although they work heavily both forward and aft, still they do not leak or show any signs of weakness."

The arrangements in the dockyard at Copenhagen for the stowage and careful keeping of these boats and their stores are most completely worked out, and are certainly the best I have yet seen.

The boats are drawn up under sheds on the sides of a creek, the first class on one side and the second on the other. Each is provided with a separate slipway of comparatively cheap construction, and can be launched at any time and in any order.

This, to my thinking, is a great improvement on the system which prevails in some dockyards of having only one slipway for a number of boats, and arrangements for shifting them endways for stowage when they are out of the water.

Large storehouses alongside an adjoining creek and communicating with the first creek are fitted up with well ventilated compartments, in which are stored all the articles required for the equipment and provisioning of each boat and its crew, the coal weighed out and standing all ready in bags, and everything ready for immediate use. As a consequence, such is the rapidity with which the boats can be got ready that I am assured that in from four to six hours from the order being received from the Admiral, a boat can be launched, manned, and equipped, and be under steam ready for sea.

With her flotilla of large boats thus easily mobilized, and the number of smaller boats she has, which can be transported by rail across the islands for the protection of the Belts, coupled with the new forts she is constructing, and her mine-fields, it does not need the eye of an expert to see that Denmark will not be a *quantité négligible* in any naval war in which access to the Baltic is important.

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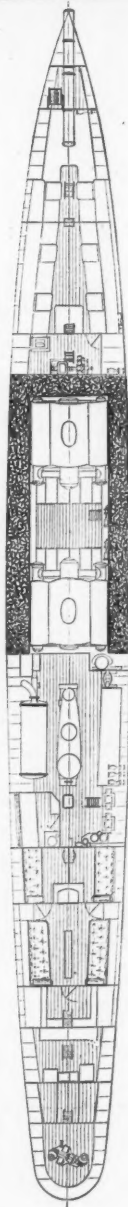
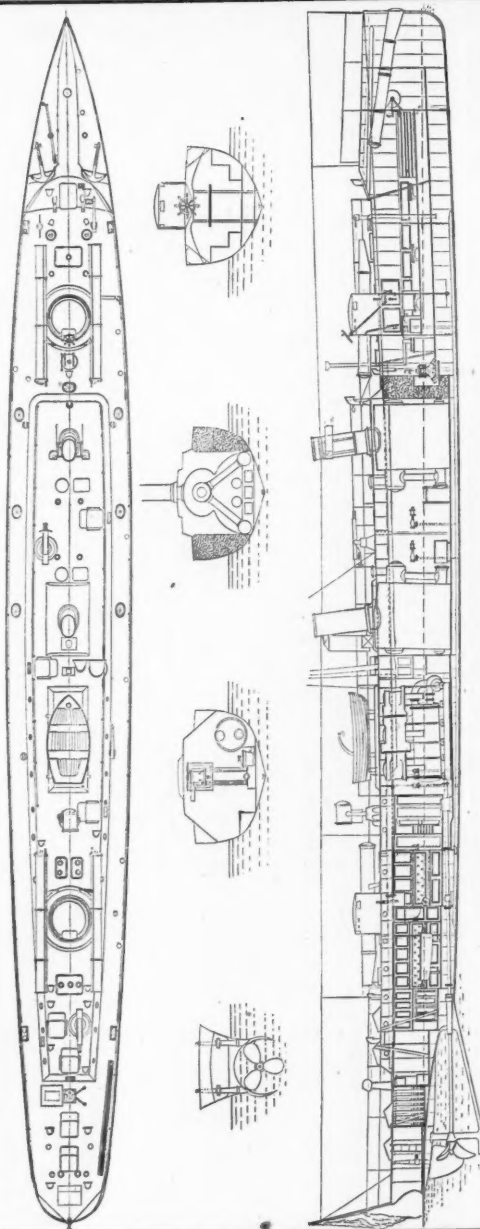
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Diag 5. GENERAL ARRANGEMENT OF 1st CLASS TORPEDO BOAT FOR THE INDIAN GOVERNMENT.

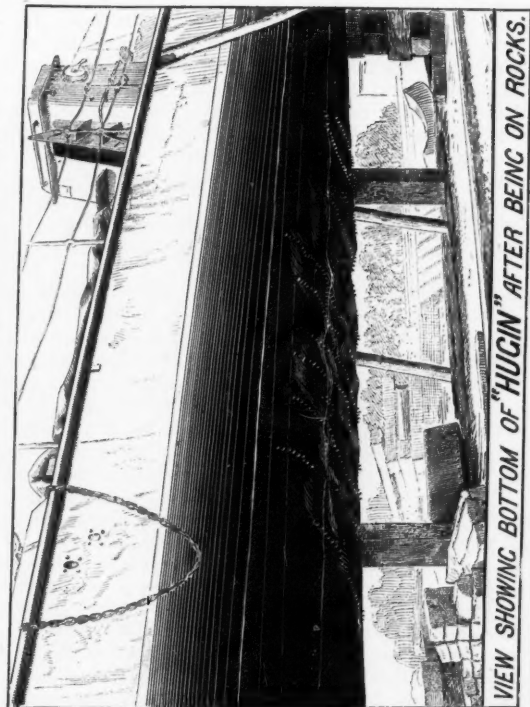
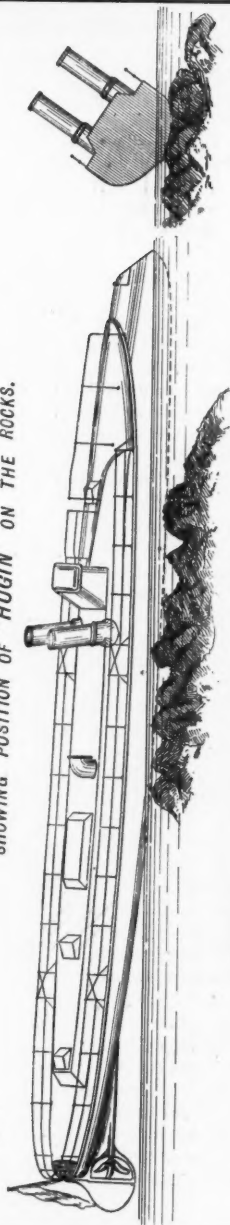


Diag 6.

SHOWING POSITION OF "HIDING" ON THE ROCKS.

Diag 6.

SHOWING POSITION OF "HUGIN" ON THE ROCKS.



VIEW SHOWING BOTTOM OF "HUGIN" AFTER BEING ON ROCKS.

Before leaving this part of my subject, I may say that we have now in hand for Denmark a couple of very powerful little vessels of about the largest size suited for railway transport, one feature of which is that by way of still further ascertaining the possibilities appertaining to our patent boilers, we propose to use a steam pressure of 250 lbs. per square inch.

We come now to No. 5 diagram (Plate 7) which illustrates a type of vessel of which we have just completed three for the Government of India.

These vessels are similar in many respects to the Danish first-class boats, but only have one torpedo tube in the bow, and two swivelling tubes on each conning tower, the armament being thus in all respects similar to that on the first-class boats built by us for the English Admiralty.

The single tube in the centre of the stem is not good, as the cap, besides being liable to be carried away by the sea, will certainly, when there is much sea on, throw up a considerable amount of spray, and so aid in the discovery of the vessel under the action of the enemy's search lights.

A better arrangement to my thinking, if a single tube is wanted in the bow, would be to put it on one side of the stem with a flush door as in the Danish boats.

I think also the tubes on the forward conning tower might have been dispensed with, three tubes being considered ample by the torpedo authorities at the Admiralty.

The dimensions of these vessels are: length, 134 feet 7 inches; beam, 14 feet 9 inches; and draught of water, 7 feet 1 inch.

The stipulated speed was 22 knots on a run of two hours' duration with a load of 20 tons on board.

On trial, the first boat, with a comparatively untrained crew, attained a speed of only 21.94 knots; while the second and third, with trained crews, attained speeds of 23.15 and 23.25 knots respectively.

These results are interesting as illustrating the fact that no matter how we may improve our mechanism, the result obtained is controlled by the human element which manages it.

The displacement of these vessels was a little over 96 tons, and the I.H.P. 1,262, giving a displacement coefficient of 207.

The metacentric height was stipulated to be between 1.2 and 2 feet, and was found on trial to be 1.6 feet upon conditions of tendering and 1.55 feet when loaded for the voyage to India.

With a view to determine the evaporative efficiency of the tubulous boilers with which these vessels were fitted, a careful experiment was conducted with the concurrence of the India Office on the advice of the Admiralty, by Professor Kennedy, of the University College, on one of the boilers of the last of these three vessels, the principal results being that with natural draught; and the engines developing 89 I.H.P., the evaporative duty was 13.4 lbs. of water per pound of coal, and a coal consumption of 2.28 lbs. of coal per I.H.P. per hour.

On another experiment with an air pressure of 0.27 inch, and the engines developing 282 I.H.P., the evaporative duty was 12.48 lbs. of water per pound of coal, and the coal consumption 1.98 lbs. per I.H.P. per hour.

On a third experiment with 0.49 inch of air pressure, the engines developing 449 I.H.P., the evaporative duty was 12 lbs. of water per pound of coal, and the coal consumption 1.99 lbs. per I.H.P. per hour.

On a fourth trial with 2 inches of air pressure, the engines developing the full power of which they were capable with one boiler, namely, 775 I.H.P., the evaporative duty was found to be 10.29 lbs. of water per pound of coal, and the coal consumption 2.26 lbs. of coal per I.H.P. per hour.

The coal consumption on these experiments seems high, but it will be readily understood that as the horse-power of the main engines only was used in the calculation, and no account whatever taken of the auxiliary engines, all of which, especially the donkey, were very extravagant in their use of steam, the result is very small indeed.

I may further add with regard to these trials, that on the natural draught trial the temperature of the chimney gases was only 421° F., and on the full speed trial when the boiler was supplying steam for 775 I.H.P., the temperature was only 777° F.

These facts, and the low velocity of the draught, fully account for the absence of flames and ashes from the chimney.

The evaporative value of the coal was found by calculation from its chemical constituents to be equal to 15.41 lbs. of water per lb. of coal from and at 212° F., and this was corroborated by a calorimetric experiment, the result of which differed only by about 1 per cent. from the calculated result.

The efficiency of the boiler with natural draught was therefore 13.4 or 87 per cent. of the theoretical evaporation, a result concerning which Professor Kennedy says:—

"It is only right that I should say that this is the highest boiler efficiency I have ever found upon any trial with which I have had to do, if indeed it is not, as I almost think it is, the highest on record in any trustworthy manner."

In summing up the result of all the trials, Professor Kennedy says further:—

"I have already remarked on the most notable evaporative efficiency of Mr. Thornycroft's boiler when working at very low pressure.

"The manner in which it retains that high efficiency when doing seven times as much work is perhaps equally remarkable.

"That one and the same boiler should be able to supply steam for powers varying from 90 to 770, maintaining so high an average efficiency throughout the whole range, is a most remarkable result, and one on which you may fairly be congratulated."

I may add that the weight of the boiler experimented on, with all its fittings, mountings, water, pipes, donkey, spare gear, and funnel, was only 11.3 tons, which gives 68 I.H.P. per ton of boiler, and compares

favourably with the locomotive boiler of about the same power in a torpedo-boat which only gives 48 I.H.P. per ton, or the same type of boiler in use in the later English torpedo-catchers, which is still worse, only giving 43 I.H.P. per ton.

These facts speak for themselves as to the advantage to be derived from the use of our boiler in the latter classes of vessel, and I may say that we have been invited by our own and several foreign Governments to submit proposals for boilers ranging from 3,200 to 6,300 I.H.P.

In my former lectures, in addition to the ordinary experiments undertaken to show the efficiency of the boats and their machinery in certain directions, I have described certain unintentional experiments which test them in an unexpected and general way, and show what may be done with them without causing fatal injury, and in this respect I may say that notwithstanding the rough usage to which these boats have been subjected, not one of all the many boats we have built has ever been lost.

My story on this occasion is that of the misadventures of the Swedish torpedo-boat "Hugin," the details of which were furnished to me by my friend Mr. Lilliehöök of the Swedish Navy.

"The 'Hugin,'" says Mr. Lilliehöök, "with three other boats was to start for a full speed run. A fearful storm, accompanied by the pouring down of hail and rain, was prevailing at the time. When the boat had traversed about a mile and attained a speed of $13\frac{1}{2}$ knots (engines running at about 250 revolutions), it struck all of a sudden against a rock with such a force that the boat was thrown up into the rock with its propeller high and dry, the tip of a perpendicularly downward-turned blade being nearly 2 feet clear of the water-level.

"When it came to rest the boat was leaning over to starboard and very near capsizing toward that side. The bottom had been moderately hurt all along the starboard keel plate from the stern aft as far as the boiler, where the bottom plating was considerably dented. The boiler was hereby somewhat dislocated, but without injuring the piping. Further aft the boat had not received any injury whatever. The fire extinguishing apparatus could not be used, because no water could be got through the feed pipe, as the inlet hole in the bottom was a foot clear of the water-level on account of the boat leaning so much over to starboard. The fire, which was very heavy at the time, had to be put out by pitching in water through the fire doors.

"Two gunboats of 600 tons each had a hard job to pull the boat off, but succeeded after several attempts. The plating had not been at all torn or broken, in fact most plates might have been put in again in repairing, but the rivets along the joints had been torn out, leaving several hundred holes in her bottom open. These holes were plugged with wooden plugs by the diver, and afterwards steam was got up, and the boat went to the station without further assistance. No injury whatever had happened to engine or boiler. The accompanying sketch will give you an idea of the appearance of the boat as it was lodging on the rock."

This sketch, so kindly sent by Mr. Lilliehöök, I have had enlarged in Diagram No. 5 as a fine example of what may be done upon occasion with a Thornycroft torpedo-boat.

The large photograph on the table shows the vessel as I saw her in the dockyard in Stockholm in August last.

As a comparatively untried weapon, the torpedo-boat has been the subject of much discussion, and many and widely differing opinions have been expressed as to its value in naval warfare.

Starting originally as a coast defence armament, the torpedo-boat has been studied under all sorts of conditions, from lying in harbour and being blockaded to keeping the sea and assisting in the blockade.

The result of these studies is best seen in the large numbers of torpedo-boats which now enter into the composition of all the more important navies, the tendency in the smaller navies being to keep the vessels of a moderate size and reserve them for coast defence, and in the larger and more powerful to increase their size, and use them more in fleet operations. The danger in the latter case is that by the vessels being made larger and more costly the advantages of numbers and the subdivision of crews is lost. Our eggs, in fact, are put into fewer baskets.

This is the case in our own Navy, where coast defence by torpedo-boats is not so much studied as I think it ought to be, both from the direct and the indirect advantages which may accrue from it.

So long as we are strong and able to keep our enemies away from these shores by blockading or masking them in their own ports, or by any other of the processes known to and recommended by experts, we shall not need torpedo-boats to prevent our seaboard towns from being harassed and requisitioned by an enemy's cruisers. But suppose that our enemies, although otherwise inferior to us were nevertheless well equipped with torpedo-boats, and by them were able to destroy some of our blockading ships, or to compel them to keep at such a distance as would enable some of their swifter vessels to escape our toils, as happened, for example, in the mimic warfare of last year, would it not be well to have a few torpedo-boats ready at each of our principal mercantile ports, in addition to those at our naval ports, to meet those vessels, and prevent the damage which would otherwise ensue?

I think it would, but I fear I am right in saying that at present there is not a single torpedo-boat at any purely mercantile port in this country, and the numbers in our naval ports are far too few to meet the demands which may be made on them should we unhappily be involved in war.

Among the indirect advantages which would accrue from a distribution of torpedo-boats around our coasts would be the encouragement of our naval volunteers, in whose hands and at whose disposal the vessels would, I presume, be placed, as has been suggested by Mr. Arnold Foster and others.

Such encouragement, similar to that extended to our military volunteers by the issue of the necessary guns, rifles, and ammunition for target practice in the early days of the movement, would have a

similar effect, and—who knows?—perhaps we might in time have a naval volunteer force attached to our first line of defence, which would rival in importance, if not in numbers, the military organization.

A corps like this would be a rare reserve, better far than any a conscription could give us, as its members, not necessarily being professional seamen, would be able to serve at sea without denuding our merchant ships of their crews, and thus imperilling our food supplies. They would have all the traditional comparative value of a volunteer, and in addition would be more thoroughly trained in relation to their work than were the victims of the press-gangs of our old wars.

It has often occurred to me that in these old wars, the pluck, resourcefulness, and endurance of our crews, independently of the skill and valour of their Officers, were the immediate means by which our victories were obtained.

But what have we to correspond with them in these days of steam and machinery?

A pump valve and a piston rod on an enemy's vessel are equally good, and equally to be depended on as the same details in a British vessel, and in this respect the only places where pluck, resourcefulness, and endurance have the best chance of doing what they did in the old days are in the stokehold and engine-room of a modern man-of-war. If to these be added daring enterprise and self-denial, a torpedo-boat is perhaps the most likely place in which they can be seen to the utmost advantage, and where men, constitutionally fit, have the opportunity of showing that in these days of science and examinations they have not degenerated from the standard which was sufficient to make and maintain our British supremacy.

As a proof that they have not so degenerated, I cannot do better than conclude by quoting the testimony of Admiral Baird in his Report on the last year's manœuvres, dated, "Off Deal, August 20th, 1888." Admiral Baird says: "The services of the torpedo flotilla have been invaluable. In regard to this portion of the Fleet, I can but observe that the skill, untiring energy, and cheerful endurance of the extreme discomfort and privation manifested by Officers and men alike have been the admiration of all who have witnessed the operations of the Fleet."

Colonel Sir OWEN BURNES: I think we ought all to be grateful to Mr. Donaldson for his very able and interesting lecture, and moreover we owe a great obligation, in my opinion, to his firm for their ingenious invention of the tubulous boiler. I had the pleasure on a recent occasion to take part in a trial of one of the torpedo-boats ordered by the Indian Government, and I must say I was greatly impressed with the working of the tubulous boiler, the almost instantaneous manner in which the boat could be stopped at full speed, and the way in which it was manœuvred backwards and forwards and in circles. I think Mr. Donaldson has brought two valuable points to our notice. First, he has reminded us of the great importance of having trained crews for these boats. I am glad to say so far as the Indian Government are concerned, they are taking steps to man with special crews the boats sent out to that country. Secondly, he has drawn our attention to the value of torpedo-boats for defensive purposes. I speak with some reserve in the

presence of naval Officers, but I have good ground for believing that the power of these boats for offensive purposes has been rather exaggerated, while that for defensive purposes has been somewhat overlooked, and I am convinced, after some small experience, that if we can only use our torpedo-boats for the defence of our naval and mercantile ports, using them as scouts, and placing them in time of danger at the mouths of rivers where it may be impossible to build permanent fortifications, and yet where an enemy's cruiser may come with impunity and destroy every ship attempting to enter that river, they would be of great service. In such rivers, for instance, as the Calcutta Hoogly, and others easily named, torpedo-boats would be of great importance. I should like to put one or two questions to Mr. Donaldson on the general subject, as his answers may add interest to his useful lecture. Perhaps he will have no objection to tell us what is the cost of such torpedo-boats as those sent out by the Indian Government, and what is the cost of their armament; also, what number of men in his opinion are required to man and maintain each boat; also, what amount of coal such boats can carry. I should also like to ask him whether he is satisfied with the way in which the steering gear is changed from the wheel in the bow to the wheel in the centre of the boat, because this was rather a weak part of the boat, so far as I was able to judge, in the trial trip already mentioned. What Mr. Donaldson has told us of the behaviour of torpedo-boats in rough weather has been extremely valuable, the more so, because his firm are, I believe, going to despatch their three torpedo-boats to India by long sea. Still, in my humble judgment, a torpedo-boat is more useful in smooth water for the defence of ports than for offensive purposes in rough water, where there is often some considerable difficulty in firing a torpedo at all, or in hitting a ship.

Professor ALEXANDER B. W. KENNEDY: My name has been mentioned in Mr. Donaldson's paper, and as I had the pleasure of making a number of trials of the machinery of one of the Indian boats, which is represented in Diagram No. 5, I should be glad to say a few words in reference to this paper, which I have heard with as much interest as I believe any one in this room can have heard it. First of all, it will be noted as regards the economical working of the boiler, that the results are extremely good. I should like to say, in reference to these results, that they were not mere results got from short or perfunctory trials of any kind. The trials were made in a most detailed fashion, and all but one of them were, I think, five-hour trials. For the whole of this time I not merely measured the coal, weighing out each cwt. as it went into the fire, but I also measured all the water with at least equal accuracy. In order to make quite sure that no error crept in, I had numerous samples of the gases drawn from the chimney, and had them analyzed, and I found of what they consisted, what their weight was, how much heat they were taking up the chimney, and so forth. This enabled me to add to the heat that went into the water the heat that went up the chimney, and in other ways to account for all the heat that I had already found to be due to the combustion of the fuel, except a difference perhaps of about 2 per cent., so that one felt quite certain that the figures could be trusted, and that they accurately represented the results of the long trials. As Mr. Donaldson has stated, no doubt if such a boat and such machines were put into the hands of people who did not know how to manage her, she would use very much more coal to do the same work, but there is no doubt that with no larger staff than her proper complement of men, the results given were and could be again obtained. The boat, which is about 140 feet long, ran at a rate of about $10\frac{1}{2}$ knots, with a consumption of 203 lbs. of coal per hour, running with one boiler only. $10\frac{1}{2}$ knots is as much speed as a boat wants in ordinary circumstances, and this happens to be her most economical condition of working. On the other hand, with the one boiler the speed was increased to about $17\frac{1}{2}$ or 18 knots average speed in about a quarter of an hour. That is to say, on one and the same day, it was necessary for the purposes of the trials to have a certain run at a low speed, and then to start the main trial of the day later on. The low speed trial being finished, the signal was given that full speed was required, and in about seven or eight minutes the speed of the engines had been increased from about 190 to 318 revolutions per minute, and the engines were doing 770 I.H.P. instead of about 90 I.H.P. In a quarter of an hour she was running steadily on her new speed, that is to say, in a quarter of an hour

from the time I told the stoker he was to go ahead, and when word was sent to the engine-room that they were to get ready for going full speed, the speed of the boat was nearly doubled, and she continued to run steadily at the full speed during the whole of the rest of the trial. That struck me as being in itself an extremely remarkable achievement. Of course that was done by one boiler, and one boiler only, and at every range of power that I have in my notes—90, 150, 280, 449, and 775 H.P. she seemed to work easily, and as far as I could see equally without priming. Even at the highest speed the combustion was quite economical, although of course it was not so economical when the boilers were forced to that extent as otherwise. I do not know whether it is worth mentioning, but I must say I found no difficulty in going into the stoke-hole, that is, in opening the door and going down, while we had air-pressure equal to 2 inches in the stoke-hole. Opening the door and closing it again somewhat frequently to let somebody up or down made no sensible inconvenience or additional difficulty to the stokers. I have dealt with the subject from a purely technical or engineer's point of view. I should like to add, however, that I was extremely struck with the steering qualities of the boat. In making her way down the Pool on dark and misty November mornings, the Pool very full of shipping of all kinds, the way in which she described figures of "8," or at any rate of "S," among the barges was really a treat to see. I started these trials—I never told my friend Mr. Thornycroft so, but it is true nevertheless—with feelings not of unqualified admiration for his boiler. Its very peculiar and novel construction made one feel doubtful as to how it was going to behave, and there were many points about which I thought it could only be tested by trials. By the time I had finished the trials, however, I must say I had come to a thorough belief in the excellence of the boiler, and that by the only satisfactory process, viz., finding out that the boiler was doing thoroughly well. There were no tokens during any of the trials that I could see of any priming taking place at all, and, as far as I could judge, the steam was dry. It is perhaps right that I should emphasize one point. Mr. Donaldson has remarked on the coal consumption per I.H.P. Of course, in a little boat of this kind, the main engines are very economical, but there are steering engines, circulating pump engines, fan engines, and the donkey pump in the engine-room, all of which are using steam not very economically, and the coal consumption per I.H.P. is merely got by dividing the whole coal used over I.H.P. of the main engines, taking no account of unmeasured I.H.P. of all the small engines; and therefore the coal consumption per I.H.P., although not so low as in first-class marine practice, was not strictly comparable with it, because of the very large proportion of the whole steam used up by the comparatively uneconomical auxiliary engines, the power exerted by which there was no means of taking into account. It is only right that this should be stated.

Lieutenant BADEN-POWELL: I should like to ask Mr. Donaldson a question that has occurred to me from watching the torpedo-boat at practice at sea, and it is as to the protection of the torpedo-boat in future wars from the quick-firing and machine-guns of modern generations. It seems to me that at present, when our first-class torpedo-boat goes into action against an ironclad, it becomes a question simply of victory or death, and that is a very serious question for consideration when you ask volunteers of coast ports to man these vessels in time of war. As a rule, men will fight for the defence of their country and their ports, but to ask them to go on a kind of forlorn hope, in which it is certain death if it be not victory, is a serious thing. I think that the subject of the protection of these boats has been, perhaps, in the minds of ordinary individuals, thought to be neglected. No doubt authorities and designers of these boats desire to carry as little weight as possible, so as to keep the displacement within reasonable bounds, so as to get the best speed, the best manœuvring powers; but it does seem to me the boats are comparatively egg-shells when placed under fire from a modern man-of-war. Of course, in larger vessels there is coal protection; in the cruisers there is a possibility of coal protection and armoured decks, but in these torpedo-boats the coal protection can only be a very small distance along the body of the vessel, and of course if the vessel is travelling across the line of fire of quick-firing guns at great speed she is something like a flight of ducks passing a shot gun, where the first bird may receive a portion of the charge, and the last and all the intermediate birds also: they get a kind of

sweeping fire. Of course, the torpedo-boats are, I presume, shot-proof, but what I should like to ask Mr. Donaldson is this: Have the builders or the Admiralty really considered to what extent torpedo-boats may be riddled, before they send these valuable craft, with valuable lives on board, into action? I do not doubt that in night fighting a vessel might be so manoeuvred as to come up with the enemy without being seen, and get away with security, but still there is a grave risk, and no man would like to show the white feather, though the risk were ever so great, and he would take her into action even though it was certain he was going to be sunk. A second question is the sea-going qualities of these boats. We know that nearly all the crews that have been on board for any length of time have been reported utterly worn out. Why is it? Is it the motion of the boats? Is it that they are comparatively unseaworthy from their excessive rolling or from some peculiarity about the style of boat which may be necessary for their speed and for their construction? Or is it that it is merely that the men are not accustomed to live on small vessels? I may say in yachting we have found in small racing boats it is very difficult to get the crew to live on board unless they are accustomed to small craft. You may get men out of small shrimping craft who live comfortably on a small narrow racing boat, whereas other big ship men turn ill, and won't serve at any price whatever. It may be the same with men-of-war's men accustomed to comparative ease on the lower deck when they are cramped up in the torpedo-boat, but still there is that objection to service in torpedo-boats which requires some explanation. The rolling of the boats is undoubted. Any man who has seen a torpedo-boat in a ground swell knows how tremendously they roll, and I would throw out a suggestion as to whether such a thing as "bilge drop keels" have been tried. I can give practical assurance that in a small sailing boat I built last year, 20 feet long by 4 feet 6 inches, and 2 feet draft, I put in two bilge drop-keels instead of a centre drop-keel, standing out at an angle of 15° to the perpendicular. They were centre-boards, in fact, only on the side, and when the boat was rolling gunwale under in running a race with keels up, we could lower 8 or 10 inches of these bilge keels and stop the rolling immediately. You could lower them as much as 3 feet. These bilge keels might also form, being steel plates, a certain amount of protection for the boiler, if carried abreast of the boiler. Whether such plates could be carried in a torpedo-boat is a question for scientific designers and builders of boats to determine, but they might get over that dangerous rolling without the additional stoppage of speed which an ordinary fixed bilge keel outside would give the boat. There is another point also on the sea-going question, and that is that this boat in time of war would be required to a certain extent to keep a look-out, to be outside the ports, and I would suggest it should be considered as to whether some kind of sea anchor cannot be used in these boats in order to conserve their steam and fuel for the vital moment, when they have either to fight or run in to give notice of the approach of the enemy. There is no doubt that the drift-net fishermen lie comfortably up if at anchor, and riding to their nets in the worst gale in the North Sea. Why should not a torpedo-boat have an equivalent in the way of a sea anchor? The quarter rudders, I suppose, are the Thornycroft patent, but I had the pleasure of being on a steam launch last year which was fitted with quarter rudders, and her manoeuvring was something ridiculously good compared to anything else I had ever been on board; you could go ahead or astern, and steer with as perfect certainty going astern as ahead. It was simply marvellous. These were rudders fitted by Mr. Harrison, an engineer. I dare say Mr. Donaldson has heard of them. At any rate, I had the pleasure of being on board the boat, and was very much struck with their efficiency. Of course they are a protection, I presume, also to the propeller, and if the boat were jumping in a sea-way it might assist in protecting the propeller from the small shell-guns of a ship. Well, now, as to the volunteers being put on board torpedo-boats, I must say, though I have had a great deal to do with volunteers since I have been on shore, I think Mr. Donaldson must agree with me that these torpedo-boats are rather too delicate an instrument to put into the hands of untrained people, and unless torpedo-boats are given to volunteers in time of peace, to enable them to be trained and to get accustomed to them, and to have the very best yacht engineers also enrolled in the volunteers to look after the engines and keep all that delicate machinery constantly in proper order, it would be simply like giving

a first-class chronometer to a child to play with. They would get out of order, and when they were wanted in war they would be useless. I have only one other question, and that is I see that some of these torpedo-boats, and I presume the latest, have twin screws. I should like to ask whether these twin screws are capable, as in a big ship, of being worked independently of one another with a single boiler, so that if one boiler were riddled, or some accident from a shell or piece of shell, or something else going wrong in one of the engines, the vessel could be taken out of action by her single remaining propeller. If so, I can only say that the twin screw is the best of any single screw torpedo-boat that exists at the present time or may be built in the future.

SIR NATHANIEL BARNABY: I have been exceedingly interested in the paper which has been read by Mr. Donaldson. I have been pretty familiar with the work which has been done by our excellent torpedo-boat builders in England and the boats of other countries, but we have had it all brought to us here to-day in a form which makes one feel how wise it has been on the part of the Government to have given a free hand to private builders to design ships of this class. I remember very well before we had one of these boats at all in the Royal Navy I was asked to design for building in one of the dockyards a boat of the kind which Mr. Thornycroft has so successfully built. I did not know him well then, but I knew that it would be an unwise thing for us to try in the dockyard to build vessels of that kind; that it would be far wiser to let these able men and their rivals do the best they could, and the result we see here before us, a wonderful result in every way, whether you look at the hull or engines or boilers. We were told when we began that these boats were so thin, that they were only the thickness of a piece of paper, there was no strength in them. But look at these diagrams. Here is a boat hung up on a rock, from which she is successfully floated, and when one sees that, one cannot help feeling that in regard to the structure of the hull the vessel is perfect. And then when you come to the engines, we see them doing in these boats what we could never have tried in ships. They have been running them at very high velocities and obtaining results which the shipbuilders have been able to follow with great advantage, but which they never could have initiated. And then as to the boiler. I see the gentleman sitting here through whom the Admiralty first introduced a boiler of this kind, I mean the "Herreschoff" boiler, into England. We heard very good accounts of its excellent behaviour, and the then Controller of the Navy, Sir Houston Stewart, was desirous of having one. One came; it had some excellent properties, but it was not repeated. Several attempts were made by English builders to make a better job of it, and now we have it. It has been so successful that my friend Mr. Grenfell, who has been referred to here, and who, although a missionary and not a mechanic at all, succeeded in putting the engines and boat together with only African labour—this good man tells me that the boat has given him no trouble whatever. The boat and engines and boilers have all worked for the five years he has had them with the greatest smoothness. That speaks most highly of what we are told is, and what really is, a very delicate instrument. It is undoubtedly true, as pointed out by the gentleman who has just spoken, that she can be pierced by shot. I have heard that so often said concerning big ships, for which I was responsible, that I can sympathize with our friends the torpedo-boat builders when it is said that the shots can get in. Of course they can, and I have no doubt the people in the torpedo-boat will feel terribly nervous when they are going to make the attack. But be perfectly sure the people will be very nervous on board the ironclad that is going to be attacked. That is an important thing. If you can succeed in making the other fellows nervous, never mind that you are running some risks yourselves. The real point lies, I think, there. It can be of no use to attempt to give protection against shot. I know that in France, where they have enormous ironclads of 11,000 and 12,000 tons, they are as nervous as can be over this fact, that the whole of their batteries can be searched out by machine-gun fire. They know that, and they do not see how to remedy it. But if you cannot remedy it in a ship like that, what are you to do with such vessels as these? The best thing you can do is to get a number of them and make them as good as ever you can. As to their seaworthiness, my own view was always that it was not fair to the sailors to put them on board these boats for long service—that they ought to be relieved

frequently from the ships to which they were attached. It is not fair to put them for many days and even weeks together to live in a vessel like that. No mortal man can build such a vessel which would have any degree of comfort in it, and continued existence in it would take the spirit out of any sailors. There are no men better than the English Officers and sailors: they would not cry out till they were obliged; but the men who are in charge ought to take care that they are not treated in a most improper manner by being called to go on day after day at this most trying work. It has been said that more of them are wanted for coast defence. I doubt whether you will ever get them. The Army officials always think they ought to have the money, and the Navy officials think they ought to have it. You have great men who are always pulling the purse-strings for the Army and for the Navy. I do not believe either would care to trouble themselves about what you call coast defence, which comes something between the two. What the Navy people would always say is, "We are not going to allow the enemy to come anywhere near Liverpool or Belfast." Let us hope it may be so, but at any rate there lies the difficulty that I fear the money will not be found, although I wish all success to Mr. Donaldson and his efforts to get an order for vessels of this kind. I have listened to his paper and seen the diagrams and the illustrations with the greatest possible pleasure. Any one who is at all familiar with the immense progress that these boats have made during the last few years can only feel proud that they have been produced in his native country, and that England has the honour to have been the first in the field with them.

Captain CRETIS: I should like to touch on one point only, and that is with respect to the boiler, especially as no other speaker has referred to it. I mean, how long will that boiler last without the deposit being cleared? and when they clear the deposit, how do they do it? It seems to me that outside the tubes, and between the interstices of the tubes, there must be a certain quantity of dust or matter from the fuel which must cohere to them. How do they clean it and clear the deposit out of the tubes?

Mr. THORNYCROFT: May I be allowed to say a few words about a question that has been put? The question of clearing the dust from between the tubes is a somewhat difficult one, and I must say it has not been altogether satisfactorily solved; but I can say this, which I think will show the meeting that although not solved, it is not so important as it might appear. In the trials which Professor Kennedy made with the boiler he made those trials with a boiler of a boat which had made all its trials; the boat had run a considerable number of trials, and the boiler had never been properly cleaned. The boiler was not in any way specially prepared for those trials. Perhaps that was an unwise thing to do, because if the boiler had been thoroughly cleaned, it might have got a little higher result. But Professor Kennedy would not allow us much higher duty. . . . He said there was not room for it in the actual duty which was contained in the coal. Previous to trying these experiments there was a certain clearance made of the dust in between the tubes. Those boilers are fitted with a large steam pipe leading into the fire-box, and before running on one occasion this was used with all the energy we could get out of it. The steam was turned on, and the result was an enormous black cloud of dust and dirt came out of the funnel, and quite obscured the free view of a barge rather near to the boat, so that it was evident something went out. That seems to make the tubes clear enough for all practical purposes, and we hope by some little alteration in the door to get out more. With regard to deposit in the tubes, I do not know of any trouble at present. The circulation in these tubes is more energetic than in ordinary boilers, and we are in hopes the boilers may run many years without any trouble. The model you saw working on the table showed one peculiarity about the circulation in these tubes. It is a kind of periodic flow, it is not quite a constant stream, and therefore the amount of energy to prevent anything sticking inside the tubes is greater than it would be if it were a constant flow. If you notice it comes out more by spurts. The Americans many years ago used tubulous boilers in which the water was pumped through the tubes, and it was said of those boilers that no actual stony deposit was lodged in the tubes: whether that was so or not I do not know. Some remarks have been made on the sea-going qualities of these boats, and I would like to say one or two words about them. The boats with

rudders on each side of the screws have some qualities which at first were feared. The stern was built hollow, and it looks at first sight as though the water would slack underneath the stern and be dangerous to the structure of the hull in a heavy sea; but I believe in actual practice the action of the propeller stops any water falling away: the stream of water follows up, and the sea does not shock, except when at anchor, and I believe there is a little shock then, but under way there is never any shock felt under the stern. This peculiar form of stern has one great advantage in maintaining the boat more nearly along the surface of the water than in the case of the ordinary form of hull. The stern seems stuck down to the sea, and the freeboard of the boat aft scarcely changes. It must be considerably rough weather when the bow of the boat will throw right out of the water, but the stern would not change more than 6 inches. Of course that is more favourable to the boat, because if the stern also moves, the motion of the bow would be even greater. With regard to the snouts that have been more abused than they need be of these boats, I think they have come into disrepute by the boats being overloaded. Some boats, built with what were called snouts, were overloaded, and it was said that they were raised because water came on board. The fact was that the water did not come on board till they were overloaded. I superintended the trials of the "Coureur" at Cherbourg, last autumn, and I was at sea a good deal, sometimes in roughish weather. I went out repeatedly, and on the boat which you see represented by Diagram No. 3, on the forward deck I did not get my boots wet in the heaviest sea. In the Indian boats, which have not this form of bow, the spray went over the top of our heads in the Thames sometimes. How you account for it I do not quite know, but it seems to amount to this, with the round bow the water in the form of spray will rise up and flow right over it, without leaving the surface of the hull. The wave will rise on it and fall again; whereas the water coming to the sharp angle of the gunwale of the higher boat, the water leaves the boat and flies up in the air. Of the forms of bow, the snout or round form gives the driest deck, is stronger, and is much more comfortable. I do not think I need trouble the meeting with any further remarks.

Mr. DELABERIE W. MARSDEN: Perhaps, Sir, as the employment of naval volunteers in torpedo-boats has been referred to, you will permit me as a member of the force to express the pleasure it would give, at all events to the members of the London Brigade, to be entrusted with a torpedo-boat for the defence of the Thames. With what has been said as to the uselessness of expecting volunteers to man these torpedo-boats without practice in time of peace, I cordially agree. Of course what the naval volunteers would wish for would be that a torpedo-boat should be entrusted to each coast corps for practice in time of peace. One advantage of such use of a torpedo-boat would be that they would gain a familiarity with the estuaries which the coast corps is theoretically intended to defend, which is so much to be desired, and I venture to suggest to Mr. Donaldson, that if the Government would grant this great boon, it might perhaps induce many of Mr. Thornycroft's own employés and the employés of other firms engaged in the construction of torpedo-boats to join not only the London corps, but other corps in the country. On behalf of the members of the London Brigade, I may say they would be most cordially welcomed. I have had the pleasure of meeting one of the employés of the Yarrow Company, a member of the London Brigade of the Royal Naval Artillery Volunteers, at the only time that any opportunity was given us by the Government of obtaining any experience in the use of torpedoes, when his experience was of great use to us. I apologize for offering these few remarks, but I have been requested by Lieutenant-Commanding Seth Smith, who has unfortunately been obliged to leave, to say a few words to express the pleasure with which the members of the London Brigade would welcome any such trust placed in them by the Government.

Admiral BOYS: Before you call on Mr. Donaldson to reply, may I ask one or two practical questions? They may be matters of history, but they may have a very important bearing on the question. The first question is: Have any experiments or trials been made and results recorded as to the right colour for painting these torpedo-boats? It is a known fact that the colour most suitable during the day is not the most appropriate during night under the electric light. I believe the colour least visible under the electric light is a black. Another point is, respecting the

escape of steam from the funnel, especially at night, because those who have conducted torpedo experiments at night are aware that generally the first indication of the proximity of a torpedo-boat is from the electric light shining on the steam escaping from the funnel. Is there any possibility of causing that escape to be delivered under water, or disposed of in such a way as to be invisible? If so, it would be a great advantage to the boat. As to the noiselessness of the boat. Are these boats and their engines as noiseless as possible? During the trials made by the original Torpedo Committee in attacking the "Monarch" at Spithead we had one launch, especially, so noisy that she was always heard before she was seen at night when it was anything like moderate or fine weather. Allusion has been made to the perforation of these torpedo-boats by projectiles. It may not be generally known, but still it is a curious fact, proved by trial, that when the bottom of a torpedo-boat has been perforated by bullets and she was going at full speed, no water entered when she was travelling fast through the water, but immediately she reduced speed or stopped, then the water began to flow in. I know that it would be simply impossible to put protection in the form of armour in torpedo-boats. If you construct vessels large enough to carry armour they become torpedo-ships, but boats could not carry it. Lightness is the great desideratum in the construction of torpedo-boats; nothing in the shape of iron plate to resist even a musket ball could be employed. I must express my thanks to Mr. Donaldson for having delivered to us so interesting and instructive a lecture.

Captain WILLAN: I rise with very great diffidence to say anything in an assembly of this kind, because I have never been in the Navy, and I am not a practical engineer. My excuse must be that I was the owner of the first steamboat Mr. Thornycroft ever built, twenty-four or twenty-five years ago, a very different boat to those we see before us now. After that I owned two others, one a boat of considerable speed, 14 or 15 knots, which I sold, after using her on the river and sea, for a torpedo-boat. I simply mention that to show that I am not absolutely ignorant of these boats, and having taken great interest in them, and having been on torpedo-boats at different times, though I may call myself a non-professional man, I have some slight acquaintance with them. I wish to say a few words about a question already touched upon by Mr. Donaldson and one or two of the speakers, as to what we may call perhaps volunteer torpedo-boats. I was very nearly prevented from rising altogether by the remarks of one of the speakers, Sir Nathaniel Barnaby, I believe it was, that it would be utterly impossible to get money for such an object. I dare say he is perfectly right in that, but nevertheless we never shall get anything if we do not try. Some three or four years ago I felt very much interested in the question, and drew up a scheme for volunteer torpedo-boats at the large ports, and submitted it to the authorities. It was favourably entertained at the time by them, but never having heard anything of it since, I suppose it has gone into the waste-paper basket. I do wish to say this—although I am perfectly well aware that these boats are most delicate machines, and that torpedo work requires an immense deal of training, and that it would be absolutely useless and senseless to put men into these boats who are not properly trained—I do believe in some of our large ports—I myself live in the neighbourhood of Southampton, and I speak of that as a typical port—I believe in the neighbourhood of these large ports you might with advantage establish one or two boats of moderate size and moderate cost; not very large boats, not very elaborate boats, not very heavily armed, and not very expensive, that might be thoroughly equipped by volunteers, and I believe properly maintained there. In all these ports you will find very skilled mechanics, men for instance working in the different shipyards and engineers' shops, and it would be perfectly easy, I am sure, to get as many of them as were necessary, very highly skilled mechanics, such men as work in Mr. Thornycroft's yard, and men of that class, and other men also, yachtsmen and men of that class. I think it would be possible, if a naval instructor were attached to them, and they went through a proper drill and a proper training of, say, a fortnight's duration each year, that you might really get a very efficient crew, and the boat might be maintained at no very great cost. Moreover, being always at the port and not liable to be called away, it would be there if it were wanted, and its stores would always be there, and the boats maintained upon the scene and ready to take the sea

at any time. I do think something of that sort might really be done at no very great expense, and moreover, I think it ought to be taken into consideration that there would be a local knowledge on the part of the crew, which I consider would be very valuable indeed. About four years ago a great deal was said about the protection of mine-fields. I believe I am right in saying I do not know that it is so now, that at that time the mine-fields of defence, such as those outside Portsmouth and places of that kind, were to be placed under the military authorities, and not under the naval. They were to take charge of the mine-fields and their protection, and it was said at that time that a number of scout and look-out boats would have to be so employed. A boat of that kind, a look-out boat, half torpedo-boat, half scout boat, might be of very great value. Supposing there were two boats attached to Southampton in the event of war breaking out, one on the look-out by the Needles, and another on the look-out by the Nab. They might be of very great use indeed, not only by what they might do absolutely in the way of protection, but they might give timely warning of the approach of vessels which otherwise perhaps might not be heard of till very much closer in. I cannot help thinking this is a subject which the authorities might with advantage turn their attention to.

The CHAIRMAN : I should just like to ask Mr. Donaldson, as he probably knows a good deal about our stokers in the Navy, whether, considering the number of torpedo-boats we should want to use, our stokers generally would require any special training for the tubulous boilers and the general work of modern torpedo-boats, more than they would readily acquire at once. I will now ask Mr. Donaldson to reply.

Mr. DONALDSON : I am very much obliged to Sir Owen Burne for the very flattering way in which he has spoken of our boats so far as he has seen them, and I have much pleasure in replying to the questions he has asked. The cost of the boats sent to India was about 12,000*l.* each, and they are insured for that amount. The actual contract price was 11,500*l.*, but there were some extras beyond that. With regard to the armament, I do not know the exact cost of the torpedo gear, as we did not supply it, it was supplied by another firm, but I think our tender was something like 2,000*l.* The crew required to man one of these boats, Officers and men altogether, would be from sixteen to eighteen; and the coal carried about 25 tons. Two of these boats I may say are now on their way to Bombay, both having left this country. They each had 25 tons on board at starting, and that is the amount the bunkers will hold. With regard to the method of changing the steering from the forward to the after conning-tower, it is not by any means satisfactory, but I am happy to say we are not responsible for it as the apparatus was fitted at the instigation of the Admiralty, from designs which they supplied. Although we do get some good things from the Admiralty sometimes, this is certainly not one of them, and we are going to alter it ourselves in future boats. With regard to Professor Kennedy's remarks about the steering down the Pool, I think the best description of that process was given by a young lady who went down with us one day, and who told a gentleman that she had been "waltzing down the Pool." This is the most graphic description of going through a crowded Pool that I have ever heard. I do not think there is any possible protection in the way of armour for torpedo-boats. If we put protection upon them we simply hamper them in speed, and the only thing we have to depend upon besides numbers is speed. Torpedo-boats going at high speed are not easily hit, and if there is a large number there is more chance of some of them escaping. No doubt there is a risk in going into action in one of these boats, but men have done it and will do it, and when they have, in addition to the ordinary incentives of warfare, the protection of their families and homes, and their native land, I think there will be sufficient inducement for many to go on this forlorn hope. The boilers are protected by means of the coal in the bunkers, and we always endeavour, as far as possible, to have the bunkers arranged, as shown on the diagrams, for that purpose. Coming end-on, the thwartship coal bunker would be forward, and being the last to be emptied, because the doors are between the boilers, would always be a protection to the boilers and engines. With regard to the torpedo-boats being riddled, Admiral Boys has given an explanation that no water does come in when the boat

is under way. We made this experiment ourselves in consequence of what happened to a torpedo-boat that we built originally as a pleasure yacht for the present Emperor of Russia. She went up to attack a gunboat coming down the Danube, and was fired at by the troops on each side of the river. The shot must have gone through her, and we were puzzled to think why she did not sink, so we got a rifle and fired a shot through the bottom of a boat alongside our works. The result was that when the boat was stationary an ordinary bucket was filled in about 25½ seconds, but when she got under way the influx gradually decreased until a speed of about 10 knots was attained, when no water came in at all; you could see it like a bar of glass below the hole. With regard to the sea-going qualities in respect to rolling and the difficulty of men living a long time on board these boats, there is no doubt the motion is quicker than in a large ship. It is somewhat analogous to crossing the Channel, whose short, choppy seas make people sick who, on large voyages, have a perfect immunity from sea sickness. In my paper I spoke of what might be done if the men were constitutionally fit. I think crews should be selected, and when men are found to be able to stand the quick motion of small boats those men should be set apart for torpedo-boat work and kept to that. Bilge keels we have tried with great advantage. In the last two boats built for Denmark, one of them, the second, was specified to be built with a bilge keel. In the centre there was a keel 21 inches deep, and Captain Neilsen writes to say that it gave excellent results. With regard to the stoppage of the speed it was found to be only half a knot in 23, so that it was unimportant, and we are now fitting one of the two boats I spoke of in which we are going to use 250 lbs. pressure of steam with side bilge keels in the ordinary fashion, about 9 inches deep. No doubt sea anchors would be very useful, but that is a matter of consideration for those who have the working of the boats. I am very glad to hear Mr. Baden-Powell's description of the working of a boat with double rudders. There is no doubt that boats which steer as well going astern as when going ahead are very much handier than those which only steer well when going ahead. It is quite my idea that these boats should be issued to our naval volunteers in peace-time in the same way as guns and ammunition are issued to the military volunteers, so that they may be thoroughly trained in their use, and I have no doubt that if this were done the naval volunteer service would become extremely popular from the healthy recreation which service in the boats would afford. I believe it has been proposed by Mr. Arnold Foster that these boats should not only be issued to the volunteers but that they should be allowed to use them when not required for practice, not simply as war vessels but as pleasure vessels, to go picnicing in; it all affords practice in the working of the engines and boilers, and in the management of the boats, and if the volunteers will take care of the boats I should say let them use them in any way they like. It would be a very decided inducement for men to join the force if they were allowed to go out when they thought proper in that way. With regard to twin screws in long boats like these, I do not think twin screws, one going ahead and the other astern, would do much in the way of turning, but with regard to the working separately, in the event of accident we can use any one boiler for any one engine in any way with twin screws. Sir Nathaniel Barnaby remarked about the policy of private building, I think that is a very important subject. If I may be allowed to criticize the present practice of the Admiralty, I think it would be better if the Staff confined themselves more to critical work, to getting designs in from engineers and shipbuilders in all parts of the country, for work to be done in private workshops and yards and criticizing them. If they go in for designing and constructing themselves, they simply become units among the mass of constructors, but if they become critics they place themselves in the forefront and are able to take advantage of the whole of the work going on all over the country. Sir Nathaniel has mentioned the Herreshoff boiler. I may say in connection with that, and with the incrustation of the tubes inside—Mr. Thornycroft having dealt with the question of cleaning the outside—that in the Herreshoff boiler it was found there was no deposit whatever inside; the alteration of the diameter of the tube, owing to differences in temperature or pressure, was sufficient to break up any scale forming, and the velocity of the circulation was sufficiently great to carry it away.

Of course the same thing would obtain in our boiler equally with the Herreschoff, but I think even more successfully, because the tubes are straighter. The Herreschoff boiler had a spiral tube, and ours being straight, I think the whole of the sediment would be carried over with greater velocity and would be ultimately deposited in the lower tubes as being the quietest part of the boiler. Mr. Thornycroft spoke of water coming over forward in the Indian boats. I think if Mr. Thornycroft had said spray it would have been more correct. Spray did rise up the stems of some of these boats and come over, but I do not think there was much rough water coming over. Mr. Marsden suggests that the employés of various firms would probably join the volunteer movement and assist in working these boats. I think undoubtedly they would, and the members of the Watermen's Company would be very glad to take charge of the boats in the way of steering and managing them, but they would require some small retaining fee, and possibly that might be an objection. As Sir Nathaniel Barnaby says, there is a great difficulty in finding money. I do not think there would be any difficulty in finding it, but extorting it from the Treasury is another question. I may say some of the Officers of the London corps have gone out in our boats several times, some even voyaging as far as Portsmouth, with the view mainly of getting a knowledge of the estuary of the Thames, and the shoals along the South Coast on the way to Portsmouth. Admiral Boys asked about the right colour. I do not know that any conclusion has been arrived at, but practically they are painted a dead dull black. I believe black is the best, but we have not been informed of this officially. In this respect I would say I think it would be very useful if the Admiralty were to send us any reports they might receive with regard to the doings of our torpedo-boats; we could then make improvements in future boats, and remedy any defects that might be reported. At present a boat leaves our yard and we hear nothing further about it. If anything very serious happens which they think is caused by any negligence on our part, then we are written to on the subject, but any good the boats do or how they use them we hear nothing of. I think we should be kept informed on these points. The steam launch Admiral Boys spoke of must have been a high-pressure boat, with the exhaust steam going up the funnel. No steam escapes from the funnels of our boats, as they are all fitted with surface condensers. In boats fitted with locomotive boilers, however, it sometimes escapes from the safety valves, and this, I think, is a point in favour of our boiler, as from its enormous strength we can afford to keep our safety valves screwed down to a greater extent than with most other boilers. With the locomotive boiler if you are using 130 lbs. of steam, you must keep your safety valve adjusted so as to blow off at or near that pressure; but with our boiler, if you are using 200 lbs. you can, if your engines have a good margin of strength, adjust the valve to blow off at 250 lbs., the boiler is so enormously strong, and I think this is a very strong argument in favour of our boiler as far at least as the steam blowing off is concerned. I was very much pleased to see Mr. Frank Willan here; it quite reminds one of old times, of the early days of our firm. I certainly think that using torpedo-boats as look-out boats would be most useful, and I believe was found so in the last manoeuvres. Stokers in the Navy would require no more training for the use of these boilers than for the locomotive boiler, and there would be less risk of accidents happening, as the parts in contact with the fire being tubes of small diameter are exceedingly strong. In locomotives if you let the water get down very low then no doubt you would have an accident, something like what happened to No. 47 torpedo-boat, when the crown of the furnace came down. There was no explosion. The crown simply crumpled like a piece of leather and sank, drawing the stays through the holes. The whole of the steam poured down through these holes into the furnace, and had it not been that the petty officer in charge fastened up the flaps, fitted in front of the ash pan to prevent increase of pressure in the furnace, driving flame into the stokehold, which he did with the idea of getting more draught, and so increasing his chance of winning the race in which he was engaged, I believe that boiler would have been simply destroyed and no accident would have happened to the crew.

The CHAIRMAN: I am sure we shall be unanimous in returning our best thanks to Mr. Donaldson for the extremely instructive paper he has read. It has called

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forth a discussion of the greatest value and interest, which will go forth in our Journal and will be of great value to all the members of the Institution and to the Naval Service. I think we may all unite in congratulating the firm of Thornycroft and Co.—Mr. Donaldson and Mr. Thornycroft are both present—on the very striking illustration the paper contains of the skill and ability that have been displayed by the firm in increasing the power of torpedo-boats during the last few years.

Friday, March 1, 1889.

GENERAL SIR FREDERICK C. A. STEPHENSON, G.C.B., Vice-President, in the Chair.

THE RELATIONS BETWEEN LOCAL FORTIFICATIONS
AND A MOVING NAVY.

By Rear-Admiral P. H. COLOMB.

In a lecture delivered in this theatre on the 18th January Captain Stone of the Royal Artillery made a sort of excursus into the domain of naval action and policy, when discussing the employment of "Quick-firing Guns for Fortress Defence."¹ In laying down certain propositions with regard to the respective functions of a moving Navy and fixed fortifications, and in declaring himself a "looker on" at the game of a combined effort, or of a rival effort, between these two elements of defence, I thought Captain Stone was doing good service in challenging, *ab initio*, those who supported or denied his positions, to come out, and state their case. As I listened to the lecture and to the discussion, I came to the conclusion that probably neither lecturer nor audience had exerted the critical faculty in sufficient strength to notice how far an acceptance of the propositions put forward might lead us if we followed them up; and at the same time, I felt that under a paper with a secondary title, it would hardly be convenient to raise a full debate on primary issues.

But those who listened with me, must, I think, agree that primary issues of great moment were raised in the paper, and pronounced upon with decision in a way which does not wholly accord with some presumably careful examinations that have been recently made.

The paper on the "Naval Defences of the United Kingdom,"² which I had the honour to read here last year, did undoubtedly tend to raise the value of moving naval defence and to depress that of locally fixed defence. Captain Stone's paper, to which, so far, this is a reply, unquestionably took the opposite view, and practically claimed that "Naval Defence" was a contradiction in terms; the rôle of the Navy not being defence at all, but attack. Here, as the lawyers say, "issue is joined" and most conveniently so for discussion. It is seen that a very wide divergence of opinion is not only possible, but is in flourishing existence, on the subject of the relations between fixed fortifications and a moving Navy, and I hardly

¹ See *ante*, p. 1.

² See *Journal*, vol. xxxii, p. 565 *et seq.*

think we can better employ a couple of hours than by endeavouring to thrash out some of the truth as to these relations.

In the Navy I venture to think that we ought to be a great deal more critical and observant than we are on the subject of our fixed, or localized, defences against naval attack. And though I advert to the matter with the greatest possible diffidence and deference, I sometimes fear that the Army is hurting its efficiency by pressing forward the idea of strong coast works at home and abroad. I sit at the feet of Colonel Maurice so far as I form any notions of military policy, and I fail to see how such views as he expresses stand any chance of being carried out, if we are to greatly shut up the military forces of this country in detached garrisons all over the world.

With still greater deference, and very humbly indeed, I venture to say that in our military policy, I seem to detect three incompatible lines being pursued. There is the line which steadily regards the invasion of these islands, not as a possible conclusion to a series of disasters such as history furnishes us with no examples of, but as an incident of war at least as prominently near us as a great sea-fight. This line, when pursued, demands the raising, maintaining, and training of a vast body of troops on principles such as we find in continental countries, and it will ask for the fortification of London, at least, if not for converting defensible points surrounding London into a series of first class fortresses. It was this policy that dictated the great land-side works which profess to defend the Arsenals of Portsmouth and Plymouth.

The second line of policy is what I understand to be that of Colonel Maurice, where the Army is to be prepared for embarkation under the convoy of, and disembarkation under cover of, the Fleet, for those sudden military attacks at unprepared points of the enemy's shores, which the rapidity and certainty of transport over a commanded sea, makes easy for this nation.

The third line of policy is that sketched by Captain Stone, if I rightly apprehend him, namely, the dispersal of the Army all over the world in detached garrisons.

The three lines of policy would seem to me to require three separate armies to carry out in their entirety; and if I endeavour in this paper to show cause against the last of them, where my naval knowledge, and some study of the question may justify me in holding an opinion, I trust I shall not have intruded too far on military ground in mentioning the first and second.

Nothing could be more satisfactorily clear than Captain Stone's expression of view: and it is always an advantage to the solution of a controverted question to start with a clear enunciation.

"My premiss is," says Captain Stone, "that the possession of naval arsenals, dockyards, and coaling stations must practically decide the question of naval supremacy; that such supremacy is absolutely essential to our existence as a nation; and that the way to secure it is to fortify and arm our own arsenals, dockyards, and coaling stations in such a fashion as to enable them to resist an enemy's attacks, and at the same time to give a free hand to the Navy to attack those of

the enemy with such force as may be available, after providing for the patrolling of our principal trade routes, and the formation of such fleets as may be considered necessary to enable us to force on a naval engagement when opportunity offers, with forces adequate to inflict a crushing and decisive blow on the enemy."

The main view here is that the fortification of posts described will enable a given naval force to do things which it could not do were the posts left locally undefended; and a principle underlies it, declaring that naval force is not properly a defensive, but an offensive force; while military force, concentrated in localities, is truly the defence of a maritime empire.

Sir John Adye, in a letter to the "Times" last year, on which I had the temerity to offer some criticism, did not quite take up the *general* relations between fortified harbours and moving fleets, but he spoke of "adequate land defences of our harbours" being the "complement" of their naval defences. He presupposed, however, at least so far as our home ports are concerned, a loss of the command of the sea, and an enemy free to attack without fear of interruption from the sea. He said: "As regards land defences, I would point out, in the first place, that should this country be threatened with attack by an expedition across the sea, it is very important that our enemies should be denied access to our harbours, and should be compelled, at all events, to make their attempt on the open coast. Their chances of success will be much minimized if they have no secure base of operations." (Sir Edward Hamley used, I think, the same argument in the same way.)

"That is one point, but there are others. When hostilities arise, our vessels, whether of war or of commerce, will often require to return to port to discharge their cargoes, or to obtain supplies of coals, munitions, and food, &c. They may also have to take refuge in consequence of damages in action, or by stress of weather; and when necessity thus compels them to seek a harbour of retreat, it is essential that they should be able to refit in security, and be free from molestation."

At this point I must discriminate a little. We can see that the same view precisely does not animate the minds of two military men, one of whom brings to it the weight of experience in a long and very distinguished career; while the other must treat it by the light of a less experienced intelligence, which even a short career has shown to be of a high class.

Present to Sir John Adye's mind is a picture of more or less failure of our naval forces, more or less incapacity to protect territory by purely naval means, or more or less defeat at sea. If fortifications are necessary to "deny the enemy access to our harbours," if they are required to enable "vessels whether of war or of commerce, . . . to return to port to discharge their cargoes or to obtain supplies of coals, munitions, and food, &c.," this must either be because of the inability of a moving Navy to do it; or because the military defence by fortifications can do it equally well at a much more economical rate. If fortifications are necessary to enable ships to take refuge

under after damages in action, or by stress of weather, the conception must be that the enemy has beaten them so much as to be able to follow them up, and to be only prevented from annihilating them, or hindering the restoration of their efficiency, by the fortifications within which they have secured themselves.

These several conditions do not appear to be at first present to Captain Stone's mind. In his view the Navy is in full competence and efficiency. There is no question of its failure in any way. But fortified arsenals and ports of supply are a *convenient method of releasing naval force which must otherwise be detained locally for the defence of the ports*. It is, in Captain Stone's conception, a fundamental postulate of naval warfare, that when an Admiral leaves the arsenal from which his fleet emerges complete, for the purpose of an attack on one of those of the enemy, he must be assured that his own port is thoroughly well locally defended. And the inference is that if it is not thoroughly well locally defended, he cannot attack, for he must remain there to defend it himself.

Undoubtedly both sets of opinions as to the relations between fortified ports and a moving Navy are largely held; and the holding of them is not confined to the military service. Being largely held, it almost inevitably follows that there must be, somewhere, a certain amount of truth about them. But, on the other hand, I think it may be safely said that none of them would arise naturally out of the study of naval history. More than that, I think they do not arise directly from the reason of the thing, when we come to face it.

I rather think such thoughts are not the cause, but the effect, of fortified ports. Having observed fortified ports all over the world, we have imitated, without much close examination, that which we have seen, and applied it to our own ports; having done so, we search for and produce such *raisons d'être* as we are able, to account for their presence, and then we call in those *raisons d'être* as an argument for the extension of the system.

The importance of the question I raise, and the difficulty in dealing with it, spring from the fact that, *primâ facie*, no one denies the value, if not the necessity, of a certain amount of local defence for the ports of a maritime empire. But then no one knows where to stop. I can never forget that while many military and perhaps more naval men think that the gigantic defensive works of Portsmouth and Plymouth have been over-done, Colonel Schaw demanded, in this theatre, in December, 1886, that 833,000*l.* more should be spent upon those at Plymouth before they could be in any way considered complete. I need hardly advert to the Report of Mr. Stanhope's Committee last year. It will be fresh in all our minds that the demand for local works, both new and additional to old ones, was very large indeed, and that the actual millions taken up by loan for this service did but partly represent the view which was put forward as to the necessities of the case.

Who is to fix the degree of fortification at which the local defence of a port should stop? If an authority declares the fortification of any port is insufficient, what arguments can we use to prove that it is

sufficient? As a naval friend of mine, for whose opinion I reasonably have a high respect, has said: "There is nothing between a light battery and a first class fortress." I, myself, have generally felt that the arguments which will call for any fortification of a port against attack from the sea will equally apply to ask for its defence against all the navies of the world. I cannot tell, myself, what the measure of the defence ought to be; and the only certain check I know, upon expenditure on local defences when once we begin, is our general way of looking at it.

It does not appear to me to be of any use saying that defence by the fortification of ports and defence by a moving Navy must go hand in hand. Were they both under the same administrative control—which could only be naval control, with any reason—they might be dealt with side by side, though I do not think that even then they could be said to go "hand in hand," but as we stand they are rivals for the open palm of the Chancellor of the Exchequer, and nothing is to be gained from not recalling the fact and stating it plainly. The reason of the thing, and the history of the thing, come to my mind with a plain conviction that fortification of ports is but an inefficient substitute for their naval defence, and that as we propose a naval increase we should logically propose a fortification decrease.

But the reverse is our policy, and the moment the naval experts urge a naval increase, the military experts, and sometimes the naval ones too, are equally, if not more urgent for local port defences.

I should like to say here, that for the purposes of my argument, and to keep it clear of side issues, I wish to roll the fortification which is got out of land batteries, coast defence vessels, and submarine mines, all into one. When I speak of fortified ports, I mean ports that are locally protected against attack, whatever the means used may be. But I do not include such local and movable defences—such light vessels—as may be prepared not to defend the port itself from attack, but to warn off the roving cruiser which might seek either to blockade the place, or to capture or destroy the unarmed ships frequenting it.

I draw a distinction, in fact, between the defence of the port against attack, and the defence of the communications of the port.

As I have said above, I think the best standard we can at present erect as to the share which fortifications should carry away from the till of the Chancellor of the Exchequer, is one dependent on our general way of looking at the whole question; and I do not know that there are any proper spectacles through which we can see, except the historical spectacles.

But let me first follow up the thoughts that have formed themselves in Captain Stone's mind as consequences of the thesis used as a starting point.

Looking at the functions of the Navy he tells us that, "upon the declaration of war one of the first duties of our Navy will be to attack the enemy's military ports, dockyards, and coaling stations, and thus secure heavy odds in our favour from the outset. In order to secure the greatest results, the rôle of our Navy must be essentially offensive, and it is much to be regretted that an unreasonable dread of bombard-

ment should have been aroused recently by the naval manœuvres, tending to form an uneducated public opinion in favour of keeping our fleets in home waters in any national emergency. Bombardment is an operation which requires a vast expenditure of ammunition and a considerable time to be effective, and the material damage inflicted is by no means proportionate to the cost of the undertaking, or to the risk incurred in carrying it out."

We have here the development of the initial idea. Our fleets are absent making attacks on the enemy's ports, which must be, by the hypothesis of possible attacks behind the fleets, well known to be empty of the enemy's warships; these latter being, as a consequence, free to do what seems good to them. But they are withheld from attacking our arsenals because of the strength of their fortifications, and from bombarding where there are none, because of the cost and tedium of the operation.

"I will venture," continues the lecturer, "to touch upon one more naval question, and that is the question of blockade. It has been stated that to spend money on land defences, while our Navy is admittedly insufficient in numbers, strength, and speed for the duties it will have to perform, is an altogether mistaken policy; and further, that if our naval strength were increased as it ought to be, there would be little or no necessity for any land defences at all, inasmuch as the enemy's ports could be so efficiently blockaded that our shores, our commerce, our Colonies, and our coaling stations would be as free from hostile enterprises as they are in peace-time. Our recent experiences of naval blockade, when the "Warspite," "Severn," and "Iris" escaped from Berehaven, and united at a rendezvous off the Hebrides with the "Rodney" from Lough Swilly, would seem to indicate that the game of naval blockade is likely to be a dangerous and unprofitable one for the blockader, and that the blockading squadron might employ its superior strength to better purpose, and more in consonance with the fighting traditions of the British Navy, by attacking and seizing the enemy's ports and coaling stations, and thus forcing on a decisive naval engagement."

"It will, I trust, be granted that the Navy has its own sphere of action quite apart from the *defence* of ports and coaling stations, and that this duty must rest principally with the land forces."

The "Times" lately remarked that a good deal of the apparent differences on defence questions proceeded from want of clear definitions. In these passages there are two words, "offensive" and "blockade," which are ambiguous, and are differently understood. It has come about that a naval meaning has enveloped the word "offensive." It is now common to hear naval Officers speak of "offensive defence," but they do not thereby mean "attack." They mean advanced defence, and I notice the word applied both to the functions of a squadron watching an enemy in his own port, and "defending" the sea behind it, by making sure that if he comes out he will be followed and fought; and to the functions of local defence vessels, which operate in waters adjacent to a port and are ready to attack an enemy beyond the reach of the batteries.

The word "blockade" I endeavoured to show in my paper on the subject, covered three distinct meanings, namely, "sealing up," "masking," and "observing," and possibly, if Captain Stone has founded his opinions as to the result of the experiments of last year, on what naval Officers have said about blockade, he may have failed to fully apprehend their meaning on account of the varying value of the term "blockade." It is well known that Nelson repudiated the term "blockade" when applied to his long watch of Villeneuve in Toulon, and, whatever differences there may be amongst naval Officers as to the capacity of a blockading squadron to seal another up in its port, there is no rift in the general conviction that the enemy must be watched wherever he is, and followed up, for that the disruption of the Empire is certain if force enough, and of the right kind, be not provided for this purpose.

Probably all that naval Officers are certain about with regard to the escape of the ships named from Bantry and Lough Swilly is, that the blockaders had neither force enough nor of the right kind for the work they had in hand. Judgment is perhaps suspended on the point whether *any* force would be competent to seal up a determined and enterprising enemy.

Captain Stone having, as we see, laid down the functions of fortifications as *freeing the Navy*, incidentally takes up Sir John Adye's position, and imagines one of our fleets being driven into the shelter of a fortified Plymouth by a superior force of the enemy, "there to refit, coal, and await reinforcements." That means, of course, the loss of the command of the Channel; and thus having gradually advanced on the original thought of a sea left open to the enemy, while our Navy makes an attack on his land, he passes imperceptibly to the contemplation of our absolute loss of command at sea as something to be looked for in ordinary course, and as something presumably recoverable by military means.

"The case of Sebastopol," he says, "is even more instructive, affording as it does an actual parallel to cases with which we may ourselves have to deal in the event of an invasion of our territory."

Here, we must observe, that never in any war which might have partaken of the naval character was there such a collapse as the naval force of Russia exhibited. Never in any naval war was there such complete and absolute command of the sea as England then enjoyed. We see, then, how imperceptibly by laying down a certain foundation and building on it, we come to the calm preparation for a state of things impossible before the entire destruction and conquest of what we call the British Empire. Yet I admit that Captain Stone is consequent in his illustrations. It has long seemed to me that if we start with supposing, to use Sir John Adye's forcible and differentiating words, that fixed fortifications are a necessary "complement" of naval force, we must be prepared to admit that total loss of command of the sea is to be regarded as but an incident of naval war.

The conception which Captain Stone has of the Navy carrying the war to the enemy's coast, while leaving an apparently open sea behind it, has so much truth in it that it may be said to be as old as naval

war itself. But two corrections appear to be necessary before we can say that it is wholly true. I cannot stop to give instances, but the rule certainly is that a Navy cannot alone make attacks on the enemy's strongholds. Perhaps, if we take out of the list of attacks the bombardments of Algiers, Acre, and Sweaborg, we shall leave nothing behind but such attacks as have been made by the Army under cover of the Navy. I am sure, when I mention it, that the fact will start up in every mind as a familiar one, but I ought not to leave it without reminding you that the want of troops was the chief thing that paralyzed the French Navy as an attacking force in the Franco-German War.

The other correction is that the Admirals who 300 years ago recommended the policy of attack, never imagined it required fortified bases behind them. Their view was the opposite. Sir William Monson, Elizabeth's youngster and James I's Admiral, in advocating that policy, wrote, "that whilst the Spaniards were employed at home by our yearly Fleets, they never had an opportunity nor leisure either to make an attempt on us or to divert the wars from themselves; by which means we were secured from any attempt of theirs."

The historical case of this active naval policy stands thus: It cannot be undertaken at all until the command of the sea is secured—that is, until it is certain that neither the base nor the communications with the base can be threatened, and that the operations cannot be interfered with from the sea. It must always be abandoned if there is the least chance of the loss of this command of the sea.

Let me just recall that so well has this always been understood that the command of the British seas was the mainspring of all our naval wars, until a time came when it was recognized that we opened the war on the basis that we held the seas. There is positively no explanation of what was done at sea in the Dutch wars but this. It is incomprehensible that the whole naval force of each side should have gathered against the other again and again, and simply fought for the mastery, unless something was to follow it when gained. And what could follow it but the power of attack on territory as well as the control of the water? Neither the Dutch nor ourselves ever got so far in mastery at sea as to contemplate attacks on territory, for we cannot look at De Ruyter's raid of 1667, which could not be put in force until we had disbanded our Navy, as an attack. It was an insult, under cover of a not very creditable quibble. Fortification could not be said to have come into any relations with the moving navies in the Dutch wars. Neither side could attack them for fear of interruption by the other.

When, later, we fell into war with France, there was at first the same thing over again. In 1690 Lord Torrington had a divided force, and found himself off the Isle of Wight in greatly inferior strength to the French. But he perfectly understood the situation. The mere neighbourhood of an inferior naval force which was free to attack was an absolute bar to any operations of the enemy against our shores. "A strength," he wrote to the Council, "that puts me beside the hopes of success if we should fight, and really may not only endanger the

losing of the Fleet but at least the quiet of our country, too; for if we are beaten, they being masters of the sea will be at great liberty of doing many things they dare not attempt whilst we observe them, and are in a possibility of joining Vice-Admiral Killigrew and our ships to the westward."¹

Here we have the whole argument "in little." No conceivable arrangement of fortifications could have strengthened Torrington's hands; there was no question of fortifications *relieving* his naval force. The French Fleet was there endeavouring to fight the English for the command of those waters, in order subsequently to make territorial attacks; Torrington could not accept battle because, if he were badly beaten, he would cease to operate as the defensive force that he was. The very object the French had in view was to drive him off the sea under territorial shelter, and therefore the provision of such shelter was not a thing to be contemplated by the Admiral. The one great fear, both in the mind of the Admiral and of the Council, was that he might have to retire north to the Gun-fleet, where his observation would be weakened; and the Council forced on the battle of Beachy Head to avoid it.² Torrington, however, saw more clearly, and he would not allow the battle to proceed so far as to leave him really beaten. By this action he won the campaign, and the French, failing to get the command of the sea, were obliged to abandon their designs.

The narrow straits in which we found ourselves, had, by the next year, given wisdom to the Council, and Russell, with a large concentrated force, fought the concentrated Navy of France at La Hogue exactly on the principles, and with the objects, of our fights with the Dutch. The French were thoroughly beaten, and ever since have commenced war with us on the understanding that they were to spend most of their time under the shelter of their fortifications, leaving the water territory to us.

Four times since then has France made preparations for an attempt to wrest this command of the sea from us, and to follow it up by territorial attack. In 1744, 1759, 1779, and 1805, fleets were fitted out to dispossess ours of their water territory, and armies were held in readiness to invade so soon as the Channel was clear. In 1744 and 1779 the fleets showed in the Channel, but dared not make good their pretensions. In 1759 the intended Channel commanders were smashed up off their own coasts by Hawke and Boscawen; while in 1805 Villeneuve failed of the nerve which was required to face the enormous risk.

In no case through all these series of operations can we bring our fortifications into relations with our fleets at all in the home waters. On the other hand, there were always the closest relations between the French fleets and the fortifications under which they sheltered themselves. Our Admirals never thought about their bases being fortified, being fully persuaded that they were themselves their defence. And the mere fact that the open anchorages of Cawsand Bay, Torbay,

¹ Entinck's "Naval History," p. 549.

² Mr. Laughton tells me that this was due to a discreditable intrigue of Russell's.

St. Helen's, and the Downs, were their *points d'appui*, accounts for the absence of all expressions of doubt as to the support which might be afforded by the shore.

But I suppose the answer may be that these were the days of sailing ships, and that steam has altered all the conditions. It is right to advance the argument, provided it be followed up, but not otherwise. Experience has taught us certain plain principles of naval war, and a new factor has been introduced. We cannot say that this new factor has voided our experience, though it is proper to say that it *may* have done so, and to examine the possibility.

What is it that steam and electricity have done for naval war? They have everywhere replaced uncertainty and chance, by certainty: they have immensely shortened times, and distances as measured by times.

If, in a general way, the balance of power on a water stage of war was liable in the days of sailing ships to disturbances through the influence of the chapter of accidents; it is far less liable to such disturbances since the days of steam. There has been experience enough to confirm the dictum. Perhaps there never was so smooth and unbroken a naval campaign as ours against Russia. It was steam alone which brought it about. It is on clear record that it was steam alone which enabled the Federal States to adopt that "anaconda" policy to which the South ultimately succumbed. It could only be the conviction of the uselessness of all attempts which caused the Germans to make practically no diversions by sea in the Franco-German War. Certainly in the Chilo-Peruvian War there were cross purposes of the old sort until the "Huascar" was captured. But a naval war between two ships on one side and one ship on the other is hardly of a character to generalize from.

And so we have it that the feature of steam naval war is certainty. If it be true, as undoubtedly it is, that combinations for attack can be more suddenly and with less warning put into action; it is also true that the time which can be allowed for the attack, before it is interrupted, is very much limited, and the limit is very much more sharply and certainly drawn. With regard to fortified places exposed to attack from the sea, the general effect of steam can only have been to add to their strength, not to demand its increase. No one has yet discovered or invented a fortified port capable of maintaining itself for all time against a sea attack. Every such place as yet has fallen when attacked from the sea¹ unless relieved from the sea, provided the attack has been persevered in. And the point is that steam has made relief from the sea more certain and more speedy than it used to be. Relief which was necessary to preserve Gibraltar used to reach that fortress in a month at the earliest. It would now reach it in three or four days. An enemy, with three weeks before him, might very well proceed to the attack of a place, which he could not dream of if he had only three days before him. Suffrein, when he dared the attack on Trincomalee,

¹ Attacked from the sea, that is, as I have said in the earlier part of my paper, by combined naval and military force, the only force capable of making a determined attack.

did so because he thought Hughes was a fortnight distant at Madras. A modern Suffrein could not now attack Trincomalee unless a modern Hughes was no nearer than Suez.

But let us construct and follow up such a case, as is suggested by Captain Stone's postulates of the relations between the fortified base and the squadron which is attacking the enemy's arsenals. Let us suppose that an Admiral is bombarding Brest with ten battle-ships, and that he is enabled to do it because his base, Plymouth, is securely fortified. I must assume that, in the view put forward, there is an unmasked force of the enemy within striking distance of Plymouth, for if there be not, the fortifications can play no part. The condition of the Admiral off Brest is that he requires constant supplies of all kinds from his base; there will be a constant going and coming of store-ships and war-ships, and every now and then an injured ship going home for repair. The Admiral is distinctly told that he has his "own sphere of action quite apart from the *defence*" of Plymouth as a port, but in the middle of his bombardment he receives intelligence that five of the enemy's battle-ships—a part of his unmasked force—are lying a mile or two off Penlee Point, just clear of the Plymouth batteries. What is the Admiral going to do? Can he go on with his bombardment, while all his supplies are liable to be cut off, and his ships, in going and coming, to be destroyed in detail? It may be perfectly true that these enemies cannot long maintain themselves, though why they should not do just as he himself is doing, it is not so easy to see. But I do not think there can be any disagreement amongst us in deciding that our Admiral has no course open to him but to abandon his attack and proceed full speed after the five battle-ships that have been threatening his communications.

Yet, if this be so, the whole theory of fortifications at the base "relieving" the naval force falls to the ground. Plymouth, separated from him, is as bad—to him—as Plymouth destroyed; and the threat of separation governs his conduct in precisely the same way as the threat of destruction does. As far as I can carry my reasoning powers this hypothetical case is conclusive, and it governs the circumstances of every open port which is fortified. There remains no ground for saying that the fortification of a port which it is necessary to keep open will in the slightest degree relieve the naval force.

But suppose Plymouth in this case to have no fortifications at all. What then? I imagine it will be said that the five battle-ships would steam up and destroy the dockyard, and so do a permanent injury instead of a temporary one. If so, the Brest fleet must still come home just as before, and, therefore, there is no effect on the fallacy that the fortifications of the base, or open port, will relieve the naval force. But an inner question arises as to whether the five battle-ships *would* steam up and damage, even if it were entirely unfortified? Naval history, as far as it goes, is conclusive with a negative answer. It tells us that the neighbourhood of a possibly interfering naval force is a complete bar to any attack on the shore whatever.

Though time presses me, I cannot forbear to give some illustrations. One of our earliest entries into the Mediterranean in force was made

by Russell in 1694. The French fleet was then carrying on operations against Barcelona, but the arrival of our fleet at Carthagea was sufficient to cause their entire abandonment, and to force the French to retire to Toulon.

Next year Russell, being engaged in an attack on Palmas, 150 miles from Toulon, abandoned it on news reaching him that the French were in a condition to put to sea from that port. This instance is the more interesting since, at the very same time, we, being unthreatened by sea in the Channel were at our leisure bombarding, and in great part destroying, St. Malo, Granville, Dunkirk, and Calais.

The attempts to re-capture Gibraltar, made by the French in 1704-5, were always frustrated by the appearance of Sir John Leake's squadron from Lisbon. Twice was the attack proceeded with, and twice was it abandoned in fear of Leake's ships.

Thurot's elaborately prepared attack on the east coast of England in 1759 was prevented by the presence of the squadrons of Commodore Boys and Sir Piercy Brett.

In 1782 Suffrein was proceeding to the attack on Negapatam with land forces. The intelligence that Sir E. Hughes was in the vicinity caused the immediate disembarkation of the troops, and abandonment of the design.

Whenever it has been determined to proceed with a territorial attack capable of interruption from the sea, it has been necessary, either to mask the interrupting force, or to employ a fleet of observation as a guard against interference.

Thus, Sir George Rooke could not have attacked Gibraltar had he not been able to do it with no more than twenty-two ships, while thirty-seven formed a guard ready to engage the French if they had appeared.

When De Grasse captured the island of Tobago in 1781, almost under the guns of Rodney at Barbados, he took care not only to employ surprise in the operation, but to have such a covering fleet as made it impossible for Rodney to think of attacking him.

When Suffrein captured Trincomalee in 1782, he believed he was taking pains to assure himself that Sir Edward Hughes' fleet was at least a fortnight distant; but yet the thing was done under guard of a fleet which was capable of fighting a drawn battle with Hughes on the tenth day, the place having fallen on the ninth.

When it was determined to attack St. Malo and other places on the French coast, in 1745, an essential part of the plan was the masking of the French war-ships in Brest by Lord Anson.

In 1761, when Keppel attacked and captured Belleisle, it was a necessary element of success that a strong squadron should mask the ships in Brest.

All these lessons are found in full force as late as the Franco-German War. Then Bouet-Willamez in command of a vastly superior fleet, yet would not risk the simple bombardment of an ill-defended coast town, Kolberg, because of possible interruption at the hands of the inferior German squadron, which was 700 miles distant.

But to make the reasoning complete, we must not omit to note that

two Commanders, and I believe two only, have been found to defy these lessons of experience—the Duke of Medina Sidonia, and Admiral Persano: the former defied the threat of the naval force at Plymouth, the latter of that at Pola. Whether a third Commander will be found to follow in their footsteps is probably questionable.

The fact that a fortified Brest and a fortified Toulon has always preserved the French fleets from our assaults is, of course, conclusive as an argument that the naval Power which has not the command of the sea, may, by means of fortifications, preserve a fleet for a time at any rate. It is a matter of fair reasoning to say that if your fleet is the most precious thing you have, even when it remains in a state of forced inaction, you can preserve it in your harbours by means of local defences of such strength as will send the enemy anywhere and everywhere before he will be driven to make his attack on the fortified ports. But we cannot forget, at the same time, that a householder can make the fastenings of his hall door so strong that the very last thing the burglar will think of will be the forcing of them. But I conceive we have established the fact that before a country can employ such fortifications at all, she must have surrendered the command of the sea, and if such command has been necessary to her empire, she must have abandoned empire.

Let us for one moment push this thought home as in the applied case of one of our fleets being beaten under the shelter of the Plymouth works. When we think of such a thing, we must, in the face of what has been said, suppose that we have no relieving fleet at hand. Were there such a fleet, it is manifest that the victorious enemy would court destruction in pursuing our beaten fleet up an intricate harbour, where it was liable to be caught by the relieving fleet. We do not, in fact, in our thoughts admit the existence of a relieving fleet. There could not be such a thing at Portsmouth, for instance. Yet the theory must be that in some way this command of the sea, which has been lost, can be regained, and be regained out of Plymouth alone. How is the fleet which has been defeated into Plymouth to come victorious out of it? And supposing such a thing possible, how long will it be before this happens, and what will the enemy be doing meantime?

It is a clear historical fact that France never tried to get the command of the Channel unless she had an army ready to make use of that command. Will she not always follow that plan, nay, is this not what we are chiefly told to fear? Would it, in any of those cases I have mentioned, have mattered the least to France whether she had driven our fleets under fortifications, or only up the harbour? Would not either process have equally served her turn? I think that when we thus press things home, we begin to see that there is great reason to doubt the wisdom of spending largely on gigantic defensive works with the idea of our beaten fleets recovering themselves behind them.

I have been considering the case of great naval bases with which it is of imperial necessity that communications should be open, and where severed communications mean loss of command of the sea,

and break up of empire as a certain consequence. These great ports do not really differ in character so far as I can see, though they differ in degree, from what are generally called coaling stations, that is, ports of supply. If we think of Gibraltar, Malta, Aden, Colombo, Singapore, and Hong Kong, we usually regard them as ports of supply for our Eastern traders, as well as for our war-ships engaged in protecting them, and without going at all beyond that thought—perhaps only including the latter branch of it—we have spent, and are spending enormous sums on the local defences of each place. What is it exactly that we are aiming at? What are the conditions we assume to be present when these works shall be brought into play? There seem to me to be but three possible sets of them. First, that the existence of the local defences shall act as such a scare to the enemy that they will never approach. Second, that we have lost the command of the sea, but could regain it if only these places are preserved to us. Third, that though the places should not fall, enterprising raiders might suddenly cut in and destroy the coal and other stores which would be, without local defences, exposed to assaults lasting too short a time to be interfered with unless every defence were on the spot.

Two of these places, Malta and Gibraltar, have had a history, and a third place of like strategical character—Minorca—brings in a history necessary to complete the other two.

The history of Malta is quite simple. France with a local command of the sea, which could not have existed in steam warfare, took possession of the place. The French losing the command of the sea, simply in consequence of the presence of a superior fleet, held on to Malta from September, 1798, for two years till September, 1800. It has never been threatened since, but we have never since lost the command of the Mediterranean Sea. The whole of our operations during our command of the Mediterranean were (unless we except the small use made of Minorca in 1799) conducted with undefended bases, generally open roadsteads.

Minorca, by the joint efforts of the Army and the Fleet, fell into our hands in 1708. It was then a duly fortified place, but we were in command of the sea. It remained in our possession till 1756. Then, as will be remembered, Minorca fell as a consequence of Byng's failure to wrest the command of the sea from the French. Coming back into our hands in 1763, we held it till 1782. From the outbreak of the war with France, in 1778, we had made no attempt to keep the command of the Mediterranean Sea. Our commerce there was of small account, and such as it was, it must have been abandoned, as the full force we maintained was but one 60-, one 50-gun ship, 2 frigates, and a sloop. When Spain declared war in 1779 there was nothing to prevent her bending all her energies to the recapture of Gibraltar and Minorca. Neither was there any relief for Minorca from the sea, and it accordingly fell in February, 1782. But again, we had restored command of the sea in 1798, and Minorca became ours once more, as soon as we desired it, without the loss of a man.

Here then are two places, Malta and Minorca, both for their time

very strong places, yet both following simply the possession of the sea. That the fortifications prolonged the sieges may be admitted, but what must also be allowed is, that these places could only be attacked by the Power which held the command of the sea. In these instances then, it seems we must narrow the functions of fortifications down to preserving the places for a limited time after the sea, and therefore the communications, has been abandoned. We cannot contemplate bringing the fortifications of Malta into actual use until we have abandoned the Mediterranean and our Eastern commercial route.

I venture to think that when great sums go into the works of Malta there is not a distinct recognition that we are preparing to abandon the Mediterranean route to India and the whole of that line of commerce.

The case of Gibraltar is full of instruction. I have already mentioned how it fell into our hands, and how it was kept in our hands in its earlier days, not by the strength of its fortifications, but by the relieving fleet of Sir John Leake, who had his base at Lisbon.

Spain being in 1780, as we have noted, in command of the sea, made a most determined set at Gibraltar as well as at Minorca. I believe we generally consider that the former place was preserved to us by its strength. We are not always reminded that what really preserved it was the employment of the whole available naval power of England in 1780, 1781, and 1782. In each of these years it would have fallen, just as Minorca fell in the last of them, had not immense fleets been dispatched to cover its re-storing and re-victualling. In January, 1780, Sir George Rodney, with fifteen sail of the line, after defeating the Spanish fleet, opened communications with Gibraltar and relieved it. In March, 1781, Admiral Darby sailed for the relief of Gibraltar with no less than twenty-nine sail of the line, near 200 victuallers, store-ships, and others. And connected with this fleet there is the remarkable fact that just about the time that it would have been off Brest, De Grasse was sailing with a great fleet and army for operations against us in the West Indies. Such a coincidence ought to make us extremely cautious in acting on the supposition that fortifications will relieve our fleets. Those of Gibraltar certainly did not in this case. In September, 1782, Lord Howe sailed with thirty-four sail of the line and an immense convoy. The fleet, engaging in a partial action with the Spanish fleet, for the third time prevented Gibraltar from falling into their hands.

We may say, indeed we must say, that but for her fortifications, Gibraltar would not now be in our possession. But we must also say that had it been necessary for us to keep up unbroken communications with Gibraltar, as it now would be on account of our trade, the fortifications would never have been called into action; and had we not for three successive years put out our whole naval strength to relieve it, the fortifications themselves would not have preserved it to us.

Again, we seem to be met by the conviction that fortifications can only represent delay. That they are not of themselves of use to

a moving Navy, as fortresses on land may strengthen the position of a moving Army by covering its flanks, &c., but that wherever communications may be given up, they may enable a place to hold out until relieved.

Some thoughts of a highly paradoxical character will intrude themselves at this point. Gibraltar was a very strong place with a very weak garrison when it fell into the hands of Sir George Rooke. Because it was a strong place it was ever after necessary to put within it a strong garrison. At a time when it was not of the slightest use to us, it exhausted our naval strength in its defence; had it not been a strong place with a great garrison we should simply have evacuated it when it was necessary to abandon the Mediterranean, just as in 1797 we evacuated the island of Elba. We should have done it in the consciousness that it would fall back into our hands as soon as we re-occupied that sea, and the place became of restored value to us.

Considering it to be merely a *depôt* for the supply of our war-ships, we must note it as an exhausted *depôt*—the shell of a *depôt*—unless we kept up communication with it. That is to say, it could not in any way have assisted us to regain the command of the sea, for we must have got the command of the sea before we could restore its value as a *depôt*. There is, therefore, a certain danger in making a *depôt* which is necessary to us too strong locally, as, should it fall—as it must if we abandon the command of the surrounding sea long enough—the fact of its strength may retard and hinder the restoration of our command of the sea. Had the Spaniards not originally made Gibraltar strong, we could not have held it when we left that sea, and Spain need not have exhausted herself in fruitless efforts to get it back again as a necessary part of her restored command in those waters.

I am only using Gibraltar as an illustration, not suggesting more with regard to that particular fortress than to say that if our communications with it are necessary, the place must be held by means of these communications and not by its isolated strength, and that the illustration governs all naval *depôts*—that is, all naval bases which are not producers of naval strength, but only *renewers* of that strength—*depôts* which in these days of steam are chiefly regarded as stores of locomotive force.

Gibraltar may not be of great importance as a naval *depôt*. In the wars of the past it certainly only shared the importance which, from the naval point of view, was held by the wholly indefensible bases of Tetuan, Lagos Bay, and Palmas Bay. But were Gibraltar once more in the hands of Spain, the necessities of our case would probably determine that if we were to retain our Mediterranean route to India and the East, we should repossess ourselves of it. It may not be of advantage to the Power whose life depends on a free Eastern highway, but it might be impossible to preserve that highway free if the Power determined to bar it were in possession of Gibraltar.

Reverting now to the three alternative functions which might be assigned to the fortification of Malta, Gibraltar, and other *depôts* on

a line of communication, we do not seem justified by history in assuming that any fortification will act as a scare to prevent the Power controlling the sea from making his attack. Secondly, we are hardly justified in supposing that if we lost the command of the Eastern route, these dépôts being still held by us would materially assist us in regaining it, though, after we had regained command, they would be of the same use to us which they are at present, and this for the simple reason that they would be exhausted dépôts when we restored communication with them.

There remains the third function of fortification, namely, the protection of the stores—the protection of the dépôt proper, and not the shell of it—from the sudden surprise and destruction which might be effected in a short time by a small force.

I think that the original claim for the local defence of our coaling stations did not go further than this. I think that if the writings of the earliest advocates of this measure are studied, it will be seen that the last thing they had in their minds was that coaling stations should, or could, stand alone. Indeed, I might almost go as far as to say that, in one prominent case, the conception now held by the general body is exactly the reverse of that put forward more than 20 years ago, and still held by him. The idea of preparation for severed communications with a coaling station, which has dominated our actual policy with regard to them, was totally absent then. The defence suggested was a local sea defence which would prevent communications being cut by anything short of a considerable force, for it was plainly felt that a dépôt must cease to be a dépôt, and must lose the whole of its value, if the stream of replenishment ceases to flow into it.

Think of Singapore for a moment, simply as a naval base. Our squadron comes in, exhausts the coal supply, and quits. The enemy closes round, seizes the colliers which would have replenished the exhausted stores, fills up his own bunkers from them, and either destroys the rest, or dispatches it to some convenient hiding-place. Our own squadron comes back, drives off the enemy, and finds an empty coal dépôt. So far as our war-ships are concerned, what difference does it make whether Singapore has altogether fallen or whether only the coal store is empty? Our squadron there is powerless, while the enemy is left in possession of the sea. The fortifications have absolutely failed to hold any relations with the moving Navy. They have not guarded its stores, and they cannot in any way assist it to recover the command of the sea.

If, on the other hand, a coal store is very much exposed, the strongest works may be passed by, and an enterprising enemy on a dark night, with good store of dynamite and combustibles, but with very little force, might in an hour or so destroy all the value which the works had been erected to guard.

I think what took place with regard to Port Hamilton gives us a most useful measure of the real naval thought with regard to the fixed defences of a purely naval dépôt. Superficially we should read it that the Navy rejected Port Hamilton as a dépôt unless it had been heavily fortified and garrisoned, but would have been glad to hold it

otherwise. And, still superficially, it would appear that the sole objection to the unfortified *dépôt* would have been the necessity of detaching ships, really required elsewhere, for its local guard.

But the moment we go below the surface we find the governing thought of a different character. Port Hamilton, if valuable as a naval base at all, would have been chiefly so for operations against the Russian Siberian ports, such as Vladivostock, in the event of war. But the naval instincts, resting on all the broad facts of naval history, declared that such operations required a preliminary command of the sea. That if such command existed, undefended naval bases would be established as close as possible to the scene of action, and Port Hamilton would, in consequence, fail to be of any value.

The general conclusion arising seems to be that no moving Navy has ever really laid a stress upon *fortified* bases. When it is in command of the sea it will always seize and hold convenient bases, but it will rarely, if ever, of itself, spend much on the local defence of the bases. Their defence is involved in the command of the sea. A moving Navy must either be in command of the sea, or fighting for it. It holds its command by the same tenure as an army does, and as two armies cannot command the same territory, so neither can two fleets. If in a given territory, the army of one belligerent cannot attack the fortress of the other while the army of the other is besieging another fortress of the first; so neither can these things happen on the water.

Fortifications will shelter beaten, and, therefore, inactive fleets, just as they will shelter beaten armies. Plymouth and Portsmouth might become to our Empire and our fleets, what Metz and Paris were to the French Empire and armies—mere receptacles, for shutting up force in, while the Empire was being over-run. I do not think that had we, thirty years ago, regarded them from this point of view, we should have spent as much on their local defences as we have done.

As regards commercial ports and out-ports, whether naval bases or not, I take it as plain that every nerve must be strained to secure our communications with them in war, and that it is extremely difficult to defend the expenditure of any money on local defence until the communications are absolutely secure. When the communications are secure, the provision of local defence on the supposition that they are not secure, becomes somewhat anomalous.

But, on the other hand, outlying property of very great value left very much exposed, is a direct temptation to the attack of it. A Malta dockyard without any defence at all, and capable of being got at and destroyed in a few hours by a couple of dashing cruisers, would be such a temptation; as we might presuppose that our communications would not always be so close as to make it absolutely certain that there might not be half-a-dozen hours when no opposing cruiser of ours would be either in port or in sight.

That is one way of looking at it. But when we are dissatisfied with a Malta dockyard which we admit is a temptation only to a great battle fleet and a heavy land force, and when we propose to spend heavily on the works protecting it, rather than on maintaining communication with it, then we are, I think, looking not at the preserva-

tion of our Empire, but at its disruption. We must be contemplating the abandonment of our route to India *viâ* the Mediterranean for some indefinite time, and we must be contemplating either the ultimate loss of Malta, or the exertion of the whole of our naval power at intervals for its relief and retention, all at a time when we cannot make the slightest use of it, and are, by the hypothesis, desperately pressed elsewhere.

I should observe that all the steam wars confirm the teaching of the sailing wars, respecting fortifications. They have never stood a determined attack from the sea; they have never given, or restored the command of the sea; but they have sheltered beaten and inferior fleets, small and large, just as they did in times gone by.

But, on the other hand, Bouet-Willamez carried on his naval war in 1870 from the wholly undefended bases of Langeland and Kioje Bay; even as we had, 15 years before, carried on ours from the undefended depôt of Nargen, and as Nelson had, 70 years before, carried it on from the anchorage of Madalena.

As I said at the opening of my paper, I did not think we could do more with so difficult a question as this, than suggest ways of looking at it. It will be apparent that my way of looking at it tends to put very great restrictions on the extension of fixed works and of local defences of any kind. I have endeavoured to look at the matter all round, and wherever I formed an opposite view, to endeavour to press it home to its consequences and see what they came to. I have not adverted much to the local defence of purely commercial ports, because I cannot shake myself clear of the conviction that it is the communications alone of these that are worth defending, and that while the ports are nothing without them, the defence of them includes, inexorably, the defence of the port itself. It is a mere instinct with me which admits light batteries at the entrances of such ports. I cannot, when I face it, reconcile their existence to my reason.

General ERSKINE: In rising to open the discussion on the very important and able paper to which we have just listened, I shall not attempt to enter into any lengthened criticism of details, but would prefer to confine the few remarks that I have to make to the general line of argument which seems to pervade the paper as well as many recent writings and utterances on the same subject. That line of argument might be, perhaps I might say boldly stated in somewhat the following way:—The construction of fortifications for the protection of our naval arsenals, and the organization of land forces for the defence of the coasts of the United Kingdom, are unnecessary. For in the event of our being engaged in war with any European Power or a combination of Powers, one or other of two things would happen: either our fleets would hold the command of the seas or they would fail to do so. In the first case, that is to say, if our fleets hold the command of the sea, an invasion of the United Kingdom would not take place, as the enemy would not dare to attempt it (we shall nearly all of us agree to that I think); and in the second case, that is to say, if our fleets had lost the command of the sea, an invasion would not take place, because the enemy would not trouble himself to land a force upon our shores inasmuch as he could bring us to submission through the instrumentality of starvation. Now, I would ask what is the logical conclusion from these statements? Is it not that we have in past times squandered many millions and organized large forces for the purpose of preventing an invasion which could never take place? And further, now that we have been brought to our senses, ought we not to dismantle our fortresses and to disband those of our land forces which are only required for home

defence? I think if such a proposal were made to the public it would rather startle them. But why should it do so if the proposal be founded on sound reason? The only answer that I can conceive would be that the public are not prepared to assent to the idea, that even if our fleet were disabled it would be possible to institute a complete blockade of the United Kingdom so as to prevent the ingress of the vessels which would be necessary to bring in our food supply. Of course even a partial blockade under the circumstances I have mentioned would be a most calamitous event: it would entail misery almost beyond description on many parts of our population; in fact, the mere thought of such an event awakens very disagreeable feelings; but as to its being the means of inducing us to at once throw up the sponge, I think that the public is not prepared to accept such a view. If a partial blockade—I am presuming that a complete blockade is not possible—would fail to bring about such a result as I have just mentioned, I think the enemy, having command of the sea, would be very much inclined to attempt an invasion, and then we should find that we had done well if we had preserved the fortifications of our naval arsenals and the land forces on which we relied for the defence of our coasts. Those forces, if properly organized, could keep the enemy at bay at all events for a sufficiently long time to enable our squadrons to refit, but of course that would not be possible unless our naval arsenals had been kept intact all the time, and that can only be done by fortifications erected for their defence. I think, in speaking of this subject, we should not leave out of sight that it is not in accordance with the spirit of this nation, that the fact of our fleets having been worsted in the outset of a war would lead us immediately to succumb to circumstances; on the contrary, as we are pretty well aware that war is a very uncertain game, whether it be waged on land or at sea, we should be inclined to hold out till the last, and should be very glad to have for that purpose the land defences which the country has up to the present maintained in a more or less proper state of efficiency. It is not safe, I know, to utter prophecies, but I venture to predict on the present occasion that the conclusion of this discussion on which we are now entering will be somewhat to this effect—that the naval forces of this country should, in the first instance, be attended to; that they should be kept up in a state of strength and efficiency which would ensure, as far as poor mortals can control the future, our supremacy at sea; but that at the same time it would be unwise to dispense with the fortifications of our naval arsenals and with the land forces which we have now at our disposal for the defence of our coasts.

General Sir **LOTHIAN NICHOLSON, K.C.B.**, Inspector-General of Fortifications: I must first be allowed to pay my tribute of praise to the lecturer for the extremely skilful way in which he has handled the subject. When a man of Admiral Colomb's calibre stands up and delivers lectures of this sort it is quite certain that he will be not only attended to, but he will to a great extent rule public opinion. I do not propose to follow Admiral Colomb through all the different arguments that he has used. I may shortly say that I do not agree with them nor do I think them logical. I think, in fact, that Admiral Colomb has achieved the *reductio ad absurdum*. Now, I do not propose, as I have said, to pull to pieces Admiral Colomb's lecture; my object will be more to address myself to the policy of the lecture. It is given at a critical time. At the present moment the nation is alive to the wants of its defences, and amongst naval and military men there is a consensus of opinion that what is wanted is the strengthening of the Navy. I cannot but think that this meeting will agree with me in feeling that unless the naval defences of England are secure, there is danger to our hearths and homes. But let us look at the history of these things. We have been treating the combined defences of the Army and Navy as one. For long years ignorance predominated. Time was when I joined the Service, that the naval man or the artilleryman was never asked his opinion upon the defence of this country; it was left to the engineer, and he carried it out according to his lights. Compare that with what it is now. The engineer carries out more or less the views of those men with whom he is associated. The artilleryman and the naval man are consulted as to what is requisite for fortifications; that is the condition of things at the present time. I agree with Admiral Colomb that if the Treasury list is only open to one Service that Service must be the Navy; and I for one should most unquestionably vote that the Navy should be the one to be strengthened. But I cannot

believe that we have fallen so low that the Navy alone can be strengthened and that the Army and the defences of this country are to be starved. Now, gentlemen, what is the logical conclusion of this lecture? It appears to me to be this: that we, military and civilians alike, are to stand on the shores of our land and watch the Navy fighting the enemy, to twiddle our thumbs in anxiety that the Navy may be victorious, because, unless it is, there is nothing behind. The gallant Admiral has practically told you that land defences are of no use, and therefore it appears to me that as General Erskine has said, the best thing would be to disarm the forts and disband our Army. Now, I do not think that the country would ever listen to such a conclusion as that. In a few words I should like to say what my own view is. At the present time the defence of the Kingdom has divided itself into two parts—one is naval supremacy, the other is the protection of certain ports and certain coaling stations at the most important parts of the Empire. With the first, I, as a soldier, do not presume to interfere; the naval man alone can give an opinion upon what the naval supremacy of England should be, and, therefore, it would hardly be becoming in a military man to give an opinion upon a subject of that sort. But with regard to the second, the necessity for defending certain garrisons, and certain coaling stations, for thirty years have we been about this work: for thirty years have the best intellects of the Army and the Navy been directed towards this one point; for thirty years have Commissions sat, and I am happy to see that Lord Carnarvon is here to join, I hope, in this discussion: for thirty years has there been a Committee sitting at the Horse Guards to consider this question of defence, and upon every one of those Committees has the Navy been amply represented, and there has been a consensus of opinion as to what these defences should be. Now I ask you, is it wise to interfere at such a critical time as this with a movement which I myself believe is going forward to a very successful issue? I do not wish, as I have said, to criticize the different points in Admiral Colomb's speech. I have no doubt that there will be found plenty of people who will be able to take up and criticize the different parts of it, I have no doubt that there are some people who will be found to emphasize the objections which he has raised to the present condition of things. I myself, regarding the higher policy, should view with great regret that it should go forth to the public that there are many people in this assembly who have advocated in strong terms the views which the gallant Admiral holds. I might say here that the press is the chief organ for the dissemination of the opinions which are ventilated in this assembly, but what happens? The "Times" and other papers will publish the whole of Admiral Colomb's speech, but in short paragraphs will only be recounted the objections of those people who may raise perfectly valid objections to parts of what he has said. Thus the public hear one view of the case, they do not hear the other. In that, I consider, is a very great element of danger. There are one or two points, however, that I should like to remark upon. The gallant Admiral has quoted history, he has brought forward instances one after another to prove his case, but it appears to me that the traditions of old times are very little guide to what must take place in the days to come; I say that there is almost as much difference between the vessels of the Crimean War and the ironclad of to-day as between the triremes of the Romans and the old sailing vessels of the days gone by; I say that when the naval man of old wars left his harbour, all he had to think about was that he might be safe from a lee-shore, and keep the weather gauge of his enemy; all he cared about was to make the best way he could after his enemy, and to fight him and to sink him if he could. But what is the case now? The case now is that every sailor who leaves his port must calculate upon the coal supply that he has in his bunkers. He cannot make after his enemy in the same way that they did in old days, but he must calculate the amount of coal which he will have in his bunkers when he meets his foe. Does that not alter the position of things? I think it makes all the difference in the world. Admiral Colomb has, I think, rather exaggerated the statement made by General Schaw in this room: he stated that there was 833,000*l.* required for the completion of the defences of Plymouth. Admiral Colomb has forgotten the fact that that sum comprised fortifications it is true, but it also included that which is infinitely more expensive—the armaments and the ammunition—the armaments, which is as necessary for the fleets as it is for the land defences. I must deprecate in the strongest terms at my disposal the setting forth of the pretensions

of one Service to the detriment of another, We naval and military men are addressing ourselves to one object. We do not wish to contend for the benefit of the one to the detriment of the other. We are only doing that which we believe the country requires of us; we are only trying to carry out to a successful issue all that the safety of our common nation requires, and, I think, for that reason we must do what we can to hide from the public any differences if we have them; but should we unfortunately have them, let us try by all means to meet each other on common ground; let us try to come together and co-operate as much as we possibly can for our common country's good.

The Right Hon. the EARL OF CARNARVON: Sir Frederick Stephenson and gentlemen, you are very good to call upon me to contribute what little I can say to this most interesting discussion, though, as a civilian, I naturally feel great diffidence in addressing an audience which I know is so largely composed of professional experts and men so well calculated to express a public opinion on such a subject. I had, however, the advantage, Sir, of being connected for some years with a Commission which was authorized to inquire into our defences abroad. It led me to look very closely into these questions, and I am bound to say that the opinion that I then formed does not concur with the views which the gallant Admiral has set forth with so much ability this evening. I will not of course enter upon what is really the larger half of this question, the defences of our arsenals and our own commercial ports. I am afraid I must dispose of the one by saying that they are only very partially armed, and of the second that they are absolutely defenceless at present. I would rather in the few observations which I would make speak of those foreign stations with which I myself and the very able Commission which acted with me were empowered to deal. I apprehend, putting it in perfectly civilian and untechnical fashion, the defence of the Empire consists really of two things,—the defence of our home shores on the one hand and the defence of our commerce afloat on the other, for our commerce is our life and being; and if it be destroyed our credit and resources perish with it. I fully subscribe to the doctrine which has been laid down here to-night, and elsewhere, that our first line of defence is the Navy; and more than that, I think we have been living in a state of—I hardly like to use the words that were on my lips, but I will say we have lived for some years in a fool's paradise, trading on our past reputation and utterly deficient in the necessary means of self-protection. With regard to the necessary amount and character of our naval defences, I will only say that the Commission of which I had the honour to be the Chairman, having to examine incidentally and collaterally into that subject, came to a distinct and decided opinion on the subject, and represented to the Government of the day, and consequently to their successors, that in our opinion the naval defences of the country were inadequate for the purpose, and I need not say how grave such a statement was. But I pass to a second branch of this question, the protection of our commerce afloat. Now, Sir, the view of the Commission was this: that inasmuch as there were great lines of English commerce of incalculable value, to be registered not by hundreds and thousands, but perhaps by millions of pounds in value, that it was of inestimable importance that we should hold the commanding points along those great sea routes. By some strange accident of fortune the principal of those governing points have fallen into the hands of this country, and it seems to me to be almost madness not to take the full advantage of them. And let me observe that when persons talk of the vast expense to which this leads us, I would observe this is very exaggerated language. The expense of defending these coaling stations is really of the most moderate description: and looking to the object which is in view it bears no kind of proportion to it. The estimate which the Commission made of the expense represents in round numbers not very much more than the cost of two large ships of war of the present day. I leave it therefore to the common sense of such an audience as this, whether it is reasonable to shrink from such an outlay, the absence of which may mean the loss of the best part of our commerce afloat. Now, Sir, what is it that makes these coaling stations and foreign defences so valuable? I apprehend, speaking roughly, generally you might classify them pretty much under these heads. First, it is intended by these coaling stations that they should set the Queen's fleet in these distant parts of the

world free to operate as naval policy may direct. Secondly, after an action they enable our fleets under the security of the guns of those defended stations to refit and to repair. Has anybody ever considered what the expense, difficulty, impossibility, would be of sending home from an enormous distance some of our large men-of-war in order to repair and to refit? Thirdly, it would enable the Queen's ships not only to refit and repair but to coal, and, as Sir Lothian Nicholson very truly said, coal under present conditions has become the very life of a ship; she cannot move without it, she is absolutely dependent upon it, and further, every one knows well that whereas our first-class commercial ships can carry and carry a very large amount of coal, the Queen's ships can carry but a very limited quantity. But further, just in the same way these coaling stations afford shelter to our commercial navy, when chased by privateers or pursued by enemies, they take refuge under the guns of those forts. In the same way, too, they are enabled to coal, and if this defence be not given to them, it is almost certain that either two-thirds of the commercial marine must be laid up on the outbreak of war, inasmuch as they would not be adequate in point of speed to escape the fast cruisers of our enemies, or, on the other hand, we should see two-thirds of them transferred to a foreign flag. It must be borne in mind that in all probability the days of conveying a merchant fleet are passed. Lastly, we must not forget that defended stations have the tendency at all events greatly to deter an enemy's cruisers. A foreign ship of war will, I apprehend, think twice and thrice before she attempts to force a reasonably armed defended station. She would run the risk of injury to herself; the certain risk of a vast expenditure of her coal, and lastly the risk of an expenditure of her ammunition, and all this at a distance from her own base. On all these grounds the Commission with which I was connected thought that these coaling stations offered very great advantages both to the Queen's Navy and also to our commercial marine. But I must take the liberty of saying this, that if these forts are not reasonably equipped and defended it would be better that we should not touch them at all. On that I entertain a very clear opinion. You need for these positions not merely forts, but you need the guns to put into those forts, and you need trained gunners and garrisons to defend them: and if you are not prepared to go to that amount of preparation it is better that you should not waste time and money upon a fruitless and perhaps mischievous object. And yet as a matter of fact that I am afraid is really the present position of things. We have a considerable number of these stations in which we have gone to great expense, sometimes ourselves, sometimes by inducing the Colonial and local authorities to undertake the work for us—we have erected fortifications at a large outlay, but in the vast majority of cases we have either only guns of a very small calibre, or no guns at all; and in one case I have repeatedly protested—I have exhausted myself in protesting against the impolicy—I should say the insanity—of leaving such a vital point as the Cape of Good Hope for years and years undefended. When our Commission, to which I have already alluded, was appointed in 1879, the first question that came before us was the defence of the Cape. We went into the question, knowing its vast importance as an imperial station, we postponed every other question to press this one question upon the consideration of the Government. We did so press it: we reported immediately and fully on it, and I can truly say, I, myself, have never lost an opportunity, both in public and private, of urging it upon successive Governments; and yet at this moment, though the forts are built or building, there is practically no armament whatever in them. I do not say there is special blame to any particular Government. The blame must be widespread. The country is to blame by its apathy and indifference to dangers which, because they are not immediately visible, are disregarded; but now that the question has come before the country, I hold it to be the bounden duty of all those who can by voice or vote bring pressure to bear to use that influence to the uttermost for the common good. And now may I, in conclusion, say this, that whilst admiring the ability with which the paper which the gallant Admiral has read to-day has been drawn up, I cannot subscribe to it? I think that the gallant Admiral has attempted to prove too much. I fully admit with him that the Navy is the first line. I wish to see that Navy strengthened, and I trust to see that this new session of Parliament will not pass without a very considerable increase; but on the other hand, if our coaling stations and ports, both at

home and abroad, are not to be placed in a state of defence, then I hold that the gallant Admiral asked us to go into, not a large, but an enormous, an overwhelming expenditure for naval purposes. The absence of defended ports means a naval increase to which it seems to me difficult to set any limit. I think we are in danger at the present moment of what I may call a see-saw of opinion. We have on the one side a very able body of men who represent to us, as I believe most truly, that the Navy requires a large increase—probably there may be a tendency to carry that view a little too far, but on this I do not now argue: on the other hand, we have a body of able men who warn us of the risks of invasion, and who actually desire to surround this vast metropolis with fortifications. Sir, as a mere civilian who by your favour this afternoon am allowed to address a professional audience, I must honestly say that I believe the truth lies somewhere in a mean between the two conflicting views. I believe there is great necessity for an increase of the Navy. I believe also in reasonable defence which ought to be given to our coaling stations and home ports, and this without the loss of an hour. I hope and believe that we shall see a real and effective step made this year. We shall be probably asked for a considerable sum, but it is not only the expenditure of money that will secure the object that we have in view, but that such an expenditure should be governed by large and wise and statesmanlike considerations.

Captain STONE, R.A.: Sir Frederick Stephenson and gentlemen, it is with considerable reluctance that I obtrude myself upon your forbearance upon this occasion, but since the gallant and distinguished lecturer has honoured me by passing in review a large portion of the paper which I was lately permitted to read in this Institution, there is no choice left to me in the matter unless I wished to appear discourteous to the lecturer himself or indifferent to the issues which have been raised. The lecturer says that he detects "three incompatible lines being pursued:" with the first of these I have little sympathy; the third, alluded to as the line sketched out by myself, is not quite a correct interpretation of my views. I do not advocate "the dispersal of the Army all over the world in detached garrisons," but that naval bases of operations and coaling stations should be rendered as far as possible impregnable against a *coup de main* on the part of the enemy's fleet, and, moreover, I agreed with Lord Charles Beresford's suggestion that coaling stations should be garrisoned by marines, unless there was some reason for maintaining a military force in the locality; now I venture to think that this line of policy is not merely quite compatible with what the lecturer calls Colonel Maurice's line, but that it is an inseparable and essential portion of it. With regard to the contention that "there is nothing between a light battery and a first-class fortress," I am somewhat surprised to hear such an argument advanced in the present day, and venture to think that the "naval friend" to whom the lecturer alludes must have made the remark some few years ago in reference to the past history of fortification; if those who are responsible for our defensive works and armaments were to rely upon historical precedents to the same extent that the lecturer does, the point of the remark alluded to would be more apparent. My own contention throughout my lecture was that the accuracy of modern artillery fire and the introduction of high explosives in shells must bring into strong relief the weak points of iron and masonry permanent works and the advantages to be gained by an extended use of earthworks, since the latter are practically not more affected by the explosion of a shell containing "Lyddite" than if it were merely filled with gunpowder, whereas the terrific effect of a high explosive shell against masonry or iron is now well known, and I quoted an experiment at Port Lobos. Sir Lothian Nicholson further informed the meeting that the foregoing facts were borne in mind in the construction of all new defensive works, and that a great deal of what I had said on the subject had actually been anticipated. Again, my advocacy of light and medium quick-firing guns in earthen batteries, as opposed to any further increase in the heavy armament in protected batteries, can scarcely be said to range me with those who pin their faith on extravagant armaments. I cannot help thinking that the lecturer is stirring the embers of a bygone controversy to no useful purpose, inasmuch as the system of fortification which he deprecates has been publicly acknowledged by responsible Officers to be a thing of the past. I do not think the argument that "as we propose a naval increase, we should logically propose a fortification decrease," is quite sound, any more than I

think that the raising of a mounted infantry regiment should entail the cutting down of a regiment of cavalry, and I trust the lecturer will forgive me if I say that the impartial discussion of any question of national defence between Officers of the Army and Navy is not likely to be forwarded by impressing upon them at the outset that they are "rivals for the open palm of the Chancellor of the Exchequer." How can the Government or the country have any confidence in the recommendation of naval and military Officers, if they are led to believe that each Service looks upon the other as a rival instead of an ally, and regards the question of national defence as a scramble, in which each is to see how much he can "carry away from the till of the Chancellor of the Exchequer?" The gallant Admiral constantly makes use of the expression "the command of the sea," and admits the value of fortified coaling stations, harbours, &c., to the navy which has lost "the command of the sea." I would suggest that now-a-days "the command of the sea" is rather a large order, and that to speak of 100,000,000 square miles of navigable waters, studded with possessions of more or less value to the British Empire, as though they could be commanded with the same facility as an important trade route or a prescribed area of territorial waters, is somewhat liable to mislead; it is quite conceivable that we might temporarily lose the command of certain waters while we retained the command of others, and surely the lecturer will allow me to believe that the defensibility of our dockyards, harbours, and coaling stations, in such a case, would be of the greatest value in "relieving" the Navy. Referring now to the sketch of Singapore which culminated in the question—"So far as our war-ships are concerned, what difference does it make whether Singapore has altogether fallen or whether only the coal store is empty?" . . . "the fortifications have absolutely failed to hold any relations with the moving navy. They have not guarded its stores, and they cannot in any way assist it to recover the command of the sea." The lecturer forgets that one of our squadrons is supposed to have drawn its supply of coal already, and that if Singapore were not fortified, even this one supply could have been captured by a single fast cruiser before our squadron appeared on the scene; moreover, there is no reason why the coal store should be found empty on the return of our squadron, unless a very insufficient supply had been stored there in peacetime, or unless, owing to the incapacity of the place to defend itself, it had fallen an easy prey to the enemy's cruisers. Besides, our war-ships are not the only things to be considered, and it would make a very considerable difference to our merchant fleet, and to those at home who were depending on the supplies carried by that fleet, if it were possible for an enemy's cruisers to sink or capture the shipping in the harbour without a single gun being fired in self-defence from shore batteries. I hope the lecturer will pardon me if I say that he has unintentionally misrepresented me with regard to the Navy *alone* making attacks on an enemy's strongholds; I distinctly said that each Service required the co-operation of the other, both in attack and defence; moreover, if there is an Officer of the Royal Marines present, he may be able to inform us that the naval authorities could, indeed, undertake attacks within certain limits, without any aid from the military authorities; there is, therefore, no occasion for Admiral Colomb to make any correction on this score, as I am in perfect accord with him. With reference to the second correction, I am absolutely at issue with him, inasmuch as I think the historical precedents of 300 years ago are of no more value to the Navy than they are to the Army from a *scientifiste* point of view; conditions have changed since those days, and we must perforce accommodate our military and naval policy to those changed conditions; naval strategy is now dependent upon coal supply and the smooth working of complicated machinery; the first object of an enterprising enemy will, therefore, be to seize our coal supplies and take possession of such places as are adapted by reason of harbours and dockyards for repairs and refitting of machinery, &c.: the possession of such points cannot fail to exercise a decisive influence upon all future naval warfare, and we have absolutely no precedent of two or more first-class maritime Powers being engaged in naval operations under modern conditions upon a scale which would in the smallest degree foreshadow the course of events in the future. The historical method of argument is seductive, but it is full of pitfalls, and the time is now ripe in naval matters to create precedents instead of following them, always excepting the good old precedent of never hauling down our colours and not knowing when

we are beaten. The lecturer lays much stress on the difficulty of supplying a besieged naval fortress with food and munitions of war, but he ignores the fact that the blockading fleet not only requires a larger supply of the same necessities, but also a constant supply of coal to enable it to keep the sea. What we have to fear is not a prolonged naval siege, but a sudden attack at any given point by an enemy who is in temporary command of certain waters; I cannot believe that many naval Officers will be found to endorse the lecturer's opinion that as our Navy is increased, so should our *fortified* coaling stations and dockyards be decreased, and that the formation during active operations of "*unfortified* depôts of supply and undefended naval bases as close as possible to the scene of action" can ever be a reasonable or efficient substitute for fortified coaling stations, harbours, and dockyards all over the world, capable of self-defence, and able to afford assistance to the Navy in time of need, whether it be for repairs to machinery, to make good damages sustained in action, or to renew the coal supply. I must apologize to you, Sir, and to the meeting, for occupying so much valuable time, and crave pardon from Admiral Colomb if in my somewhat humble military position I have been indiscreet in taking too warm an interest in the affairs of the sister Service.

Captain P. FITZGERALD: It is impossible in the short time at our disposal to criticize adequately this very able paper. Admiral Colomb told us that he was going to take the position of a special pleader in the case, and in a letter which he addressed to the "Times," a short time ago, he said he was going to take the position of the "devil's advocate." I rather think he has done so. I regret that he should have taken that position, and that he should—if I may say so without any offence—have exaggerated or overrated his case, because it is a case that does not require overstating; the facts are so clear and palpable that a simple statement of the relative importance of naval and military defence for this Empire is sufficiently obvious, if set forth plainly without attempting to bring it to the point of *reductio ad absurdum*, as Sir Lothian Nicholson has said; no doubt Admiral Colomb's desire is to raise a friendly discussion between Officers of the Army and Navy as to the respective merits of their modes of defence, and it is only to be supposed that each side should take the line of "nothing like leather." But it seems to me that the case is so absolutely clear that the defence of the Empire is so absolutely dependent upon the Navy that the other side are "not in it," to use a sporting expression. I do not wish to say anything in the least offensive to the soldiers, but they are "not in the hunt" at all in the matter. I am quite sure they would not accept the rôle of standing still to fire guns from behind an impenetrable fortress. They will have their rôle in the defence of the Empire in defending India, where they will have their work cut out, but they have nothing to do with the defence of this United Kingdom, because, once it comes to fighting on these shores, if once a volunteer fires a shot in anger, all I can say is, it will be "all up," he might as well fire blank, every bit. ("Why?") Because you will be starved. ("Explain.") I will explain in one minute. I have said I thought Admiral Colomb overstated his case, and I am bound to give you some instances. I think when he pointed out the case of Plymouth, where the ships were supposed to be led away, or to go and attack Brest, and were to be cut off from their base by the enemy, he said it would be all the same to the Admiral whether Plymouth was taken altogether or whether the communications were cut. It would be all the same for that Admiral and for that particular enterprise, but it would not be all the same to the country. It would stop the particular enterprise in hand, but there would be a vast difference in the general effect on the country. And then when he goes on to point out that fortified places have always fallen when they have been steadily attacked from the sea, he forgets there are many places which have never been attacked because they were supposed to be impregnable. If it was a rule that a fortified place should be attacked from the sea and taken, why was not Cronstadt taken, or why did the naval attack fail at Sebastopol? Sebastopol was taken afterwards, it is true, but it was from the land. Also with regard to Singapore, I think he overstated his case, and Captain Stone has touched upon that very ably. Admiral Colomb assumes that one swoop is to take away all the coal and leave an empty store for the next comer. Singapore unfortified would be a supply to the enemy; fortified it would be able to resist attacks of light ships, at any rate, and to replenish our own ships when they came

there. That is all, I think, I have to say in opposition to Admiral Colomb. I think Lord Carnarvon rather missed the point when he talked about a fleet refitting under the guns of Singapore. That assumes that they are defeated. I am quite with Admiral Colomb there. They can refit in an open harbour unless defeated, but if they are defeated they get under the guns, but that means that they have lost the local command of the sea, and that all communications would be cut off. I think that these technical discussions only lead up to the main point, which seems to me to be this, that the main arteries of trade and commerce for this country are all over the world. These arteries contain the life's blood which is essential to the existence of the Empire. I won't confine myself to food. It is not a question of food only, it is also a question of raw material. There is no use in your saying, as Mr. Wilton said in a speech the other day, "I will convey food into the country; it is impossible that they can blockade us." True; but at what price, and who is going to pay for it? What is the use of bringing food in at famine prices? Are we not aware that there are 37 millions of people in these islands, and a large proportion of these, though not now at starvation point, certainly would be if you doubled the price of bread. Therefore, you are bound to be brought to your knees at once if your communications and your raw material are cut off. It is no use bringing in food if the people cannot buy it, and you are, therefore, absolutely dependent upon raw material for manufacture. Therefore, the whole question hinges itself on these arteries of commerce. If you cut a man's arteries it is a mere work of supererogation to knock his brains out, because you would have already killed him, and that is all you want to do. I daresay you all remember the concluding words of that very able digest by the Committee on the Naval Manœuvres, where, after summing up the whole case, it is said, "By her Navy she must stand or fall." In conclusion, I would venture to read you a short quotation from the "Times," in a leading article of the 3rd of January. The "Times" makes this statement, and I should like to hear this controverted if possible: "If the Navy is made thoroughly competent for its work, no other defence for these islands or for the Empire at large will ever be called into play. If the Navy fails us, no other defence will avail to avert crushing disaster." There is a plain statement, and if that can be controverted by our friends the soldiers, let it be done.

Colonel MAURICE, R.A. : The very kind reference which Admiral Colomb has made to me in the early part of his paper challenges me to say exactly how far I think we ought to expend our Army in these fortresses and coaling stations so as to lose the force which we might elsewhere employ. Now, first of all, I particularly thank Admiral Colomb for having drawn attention to that aspect of the subject, that is to say, the use of our Army in co-operation with the Navy for certain European purposes, because it seemed to me a little strange to hear a statesman to whom we owe so much in these matters as Lord Carnarvon sum up the great subject of our defence by saying that it consisted in the protection of our shores and our commerce. I think there is an omitted third clause there of great importance, and that is the protection of our great Eastern Empire and our Colonial possessions. Now my purpose, if my friend Captain Fitzgerald will allow me to be "in it at all," speaking purely as a soldier, without attempting to intrude into any question of naval strategy or tactics, has been, in the statements to which Admiral Colomb alluded, to give what is not my opinion only, but what is the absolute judgment of the statesmen of the Continent to my certain knowledge, that the Navy can, by rendering such assistance as is in its power to the armies of possible allies, and by transporting an army and enabling it to strike at certain places, not directly, but indirectly carry out that third part of the programme, and ensure the safety of India and the Colonies. It seems to me that it is vital to us that that third point, the value of the Navy and of our transporting power for the defence of India and the Colonies, should be recognized. I, at least, may claim not to have been calling out that there is nothing like leather, because in everything that I have been saying on these subjects I have been crying out for the strengthening of the Navy; and I have gone further than that, because, although I am well aware that what is most necessary in order to bring our volunteers and our home army into the condition of an effective army in the field is an increase of my own arm, the field artillery, I have

still maintained that that increase should not be made until the Navy has first had its proper share of attention; I may say it was from Admiral Colomb, and from his brother in earlier years, and from my friend the late Colonel Home, who always showed the most eager anxiety in supporting the Navy in all these matters, that I was first brought to pay attention to these great questions of the coaling stations and our lines of commerce. As it happens, I was the Secretary of the Committee whose duty it especially was to determine the garrisons which should be assigned to those coaling stations, and I can assure Admiral Colomb pretty definitely, without touching upon any matters of confidential information, that the policy that has been adopted throughout in relation to them is precisely what both he and I wish, that is, to minimize the garrisons we detach from our active army to the very lowest possible point, trusting as far as possible to the patriotism of the Colonies for local assistance on the spot—to minimize it almost entirely to such a supply as may be necessary of expert gunners, who shall train and develop the gunnery practice of the men on the spot, and that for the single purpose of doing the precise thing which, as I have understood, both brothers have insisted upon, namely, providing such protection to our coal that we shall not be exposed to the danger of a single cruiser running into a coaling station, filling her bunkers, burning the rest of the coal, and getting clear away. That is the difficulty that must always present itself to the Navy, unless there be a change of policy at the Admiralty. Everybody who has had the least to do with Admiralty decisions in the matter will bear me out that, not once, but again and again, the Admiralty have declared that they will in no way whatsoever be responsible for the defence of ports or coaling stations, and they insist upon it that the Navy shall be kept clear for the work of destroying the enemy's fleets on the open sea, and that the coaling stations and ports are absolutely out of their charge. If the Navy intends to take charge of these ports and coaling stations, and means to be responsible for their guardianship, let it be understood that they do so, but do not let it go forth as the Admiralty says at present: "We will not send a ship to you of any kind to defend Singapore which we guarantee shall remain there. We will send you a gunship if it happens to suit our convenience, but we will not be responsible for detaining it there so as to defend Singapore." That question should be settled. I do not think myself it is a question in which the Army can have any other than one interest, and that is to have as small as possible a portion of the Army told off for the defence of these distant coaling stations, because the Army cannot be spared for their defence without detracting from its available power elsewhere. If you do not want us there, then let us get away. We none of us want to be there. But do not let there be any misunderstanding about it, and do not let us be told that you are relying upon us for the defence of these stations, when in fact you are not doing so. There is one other point which has been raised several times in a general form, viz., the present uncertainties of naval battle-action, that I want to illustrate by one specific question: I do not know how far the elaborate experiments which France has been of late making with high explosives are known to any Officers in this room, but they have been carried out with the greatest care, the most elaborate skill, and at unlimited cost; nor is it a secret that France has so absolutely convinced herself of the power of high explosives, both against ships and in the field, that she is storing them as rapidly as she can, and spending large sums in the elaborate storage of fresh explosives, continually employed in the refilling of shells that have deteriorated, so that she always has fresh material ready for instant use. I am told at the present moment the Navy do not like touching these high explosives. I can well understand it; there are not many of us that do, and one difficulty undoubtedly about all these matters is that shells filled with high explosives do not keep, and that you never know when you are going to run some risk with them if they have not been recently filled, or that they are not very suitable for ships like ours, commissioned for three years at a time. What I want to ask Admiral Colomb is this: is it not possible at least that for the very short move across the Channel, high-explosive shells, placed fresh on board and possessing the appalling destructive power which is attributed to them by those who have carefully tried them, may prove unpleasantly effective against a fleet of ours which, because of its duties requiring it to have on board for distant voyages explosives which will keep, has not ventured to make use of them? Is it not at least possible

that the little blue streak of water might be cleared by them for twenty-four hours? If that is so, I want to know, do you really accept that statement in the "Times" article, that if only the danger and the possibility of invasion is upon us we are going to bend the knees at once. It is not in this case a question of our being starved, or anything of the kind. That may happen without our being starved, and without our having had our commerce seriously injured at all. I, for one, say there are more than 30 millions of us in these islands, and I do not think we mean to submit, and I do not believe the "Times" represents the feeling of the English nation that they are going to submit because the mere danger of invasion has come upon us. We must be ready on shore as well as by sea if we are not to run this risk.

Admiral Sir E. FANSHAWE: I wish to make one or two observations upon what General Erskine has said, because I thought his remarks were not antagonistic to the paper that Admiral Colomb has read. He showed that if we were to do away with all our land fortifications we should do wrong; but I do not understand Admiral Colomb to have said we should do so in his paper. I understood him to say that, as has been done in former times, we ought to have means of defence in case of raids, or that any portion of an enemy's invading army effected a landing in this country. I think the two things are very much in accordance with each other. After General Erskine the meeting was addressed by Sir Lothian Nicholson. I think when he said that there was but little in former naval experience to guide us for the future, he expressed an opinion absolutely contrary to that of the Navy. The coaling stations have been spoken of a great deal, and though, I must say, I think Admiral Colomb's general principles as to the manner in which this country ought to wage naval war are sound, yet I do not think they are applicable to the circumstances of coaling stations and foreign fortresses such as Malta. We have had the advantage of hearing Colonel Maurice, who explained what the case really is with regard to these; and I entirely concur in what was said by Colonel Maurice on the subject. Admiral Colomb asked us, in order to establish the principles on which we should wage naval war, to look to past history. Everyone knows that the principles of war are not things that readily change; they lie deep, and are not variable. The instruments and methods with which war is waged vary, of course, as science progresses; but the principles remain the same. Admiral Colomb asked us to look into the history of the Navy with a view to ascertaining what our position is with regard to the strength required for the Navy. I do not think it can be denied, for a moment, by anyone who does so, that this country depends altogether to maintain the position it has as one of the greatest of the great Powers of the world, upon its having the command of the sea. If there were any question of our losing that command of the sea, we ought immediately to make the Navy strong enough to prevent it: the loss of it is not a thing to be allowed: it is that on which the existence of this country depends—as a great Power. Admiral Colomb went through the history of the country, and referred to many cases to enforce this. Taking the crucial instances when the war operation in contemplation was the invasion of this country, he mentioned four within the last 150 years. The two most important were those in the Seven Years' War in 1759, and the great endeavour of Napoleon. They show that the military opinion of those who undertook them was, that the only way to do it was to prevent us from having the command of the sea. I should not care to refer to the first one at any length, because the second is much more important; but from the first one we may learn what this country can do when it is ruled by a Minister who understands and thoroughly grasps the fact that it is his business, and a great proof of his statesmanship, to wield and to apportion the various portions of the war resources of the nation. They will see what we can do when that is the case, instead of its being left to the two Departments to settle themselves. I now refer to the last great attempt at invasion under Napoleon, claiming as his opinion, being that of one of the greatest masters of war the world has ever produced, that this country was not to be invaded until he had acquired from us the command of the seas where his invasion was to be carried on. He had an enthusiastic army which he had trained for years for the purpose; but he could not get the command of the sea away from us, and he therefore failed. I think anyone who will consider that instance will find sufficient reason for saying that it is absolutely necessary that we should allow no question

whatever about our having the command of the sea, as far as such a thing is possible to be made mathematically certain. Sir Lothian Nicholson thinks that it was to be regretted that such a paper as Admiral Colomb's had been read, because the Press will publish it; and the public will only hear one side of the question, because the paper will be given in full, and the discussion will be condensed. But the very *raison d'être* of Admiral Colomb's paper, from its first paragraph, is that certain statements had been made in a former paper, written by an Officer on a detail of one branch of military science, viz., arming batteries with quick-firing guns. A great part of that paper went into the fundamental rules upon which the whole armed force of this country are to be employed in war. I myself, when I heard the arguments, thought them beyond measure unsound, and to indicate that that Officer was not very well acquainted with the history of the wars which this country has been engaged in during the last two centuries; and I very much regretted that it should go forth from this Institution without some reply; but I felt that we were then discussing quick-firing guns in batteries. But the opinions expressed in that paper have gone forth to the country, and I think it was quite right that they should therefore be discussed here. Now, with regard to the value of the past history of the Navy as a guide to the future, we should recollect that, included in naval history, the Army has got a very glorious history. I should like to trace that glorious history of the Army through its annals. I would go back as far as the war of the Spanish succession, which rendered immortal the name of Marlborough. There was an English army on foreign soil. How was that army supplied? That army was supplied because we had obtained the command of the sea at the Battle of La Hogue. Go on to the next great war—the Seven Years' War. The brilliant exploit of General Wolfe, which ended in the capture of Quebec, was rendered possible by our having the command of the seas, to maintain which large fleets blockaded Brest and Toulon. The Battle of Plassy was won by Clive; but this would never have been fought if Admiral Watson had not been there with his fleet to protect and co-operate with the army. In the next war the great operation of the Army was the defence of Gibraltar, which Admiral Colomb has referred to. Look at the wars of Napoleon. The brilliant expedition to Egypt was only possible on account of the command of the seas having been previously obtained by the Battle of the Nile. I need not dwell on the Peninsular War, which was rendered possible by the absolute command of the sea having been confirmed at Trafalgar. These are facts in which I think our friends of the Army must recognize that those brilliant achievements which have distinguished their Service so greatly for the last 200 years have been possible because we held the command of the sea.

[The discussion was then adjourned to 4th March.]

Monday, March 4.

ADJOURNED DISCUSSION.

GENERAL SIR FREDERICK STEPHENSON, G.C.B., in the Chair.

Lieutenant-General Sir GERALD GRAHAM, U.C., G.C.M.G., K.C.B.: Sir Frederick Stephenson and gentlemen, whatever may be the merits of Admiral Colomb's interesting paper as a sample of sound reasoning, there can be no question as to its ability, and as to its having proved most valuable in eliciting expressions of opinion from competent Officers of both Services, though I think the public will naturally attach more importance to the opinion of a naval Officer who differs from Admiral Colomb, as all have more or less hitherto, than to that of a military Officer like myself. I think that all who wish well to the defences of the country, and I include the gallant Admiral, although an adversary, have reason to feel grateful to Lord Carnarvon for the admirably clear statement he made at this Institution at the previous meeting, and that we may feel some confidence in the decision of a Commission of which he

was President. Although I disagree utterly with the gallant Admiral's conclusions, I cannot resist a certain feeling of admiration for his perfect confidence in the power of our Navy to keep the command of the sea under all circumstances as its indefeasible right and attribute. This, however, seems to me very much as if a General started with a plan of campaign—the phrase is rather in bad odour just now—the successful execution of which depended on his winning every battle. "Rule Britannia" is a very fine song and we have often joined in the chorus, but when we meet in this Institution we ought to put sentiment on one side and look facts soberly in the face. I should like to hear from Admiral Colomb what this ideal command of the sea means under present conditions, and according to his theory of defence by a moving navy. What fleets would be required to secure our coasts, communications, and commerce against the greatest probable or possible combination of naval Powers? What would it mean in money outlay and annual expenditure? Finally, is it practicable or only a dream? We know on the best authority that at present we should be decidedly inferior to a combination of two great naval Powers; nevertheless, Admiral Colomb bases his whole theory of Imperial defence on our being everywhere superior at sea. With this assumption of conditions which do not exist, Admiral Colomb regards the fortification of our arsenals, dockyards, and coaling stations as unnecessary, for, far from being factors of strength to our naval power, they weaken it by taking money which ought to be expended on the fleets. In short, the Navy is to undertake the defence of the United Kingdom and of our lines of communication and commerce, and it is too confident in its invincible power, according to Admiral Colomb, to need any reserve, so that, as clearly stated by General Erskine, all our land defences may be dismantled and our reserve forces of militia and volunteers disbanded. I was glad to hear this condition frankly adopted by Captain Penrose Fitzgerald, R.N., though the gallant Officer's statement was received as an excellent joke, as it emphasized what Sir L. Nicholson called a "*reductio ad absurdum*," though I cannot say if this was the point Sir Lothian had in his mind. We may be on the eve of a very critical epoch in our national history, and the mind of the country, and therefore of Parliament, seems at last awakening to the dangerous state of our defences, and we must consider the probable effect on the public mind when it is known that an eminent naval Officer, speaking with weight and authority on the naval armaments of the Empire, gives it out as his deliberate opinion that our policy of defence for the last thirty years has been utterly wrong. I may be mistaken, and sincerely hope I am, but I cannot help fearing that this paper may do harm by obstructing the efforts of patriotic statesmen like Lord Carnarvon, who ardently desire to bring the pressure of public opinion to bear on the Government to complete the defences of our ports and coaling stations. When the public sees its naval and military experts at loggerheads on the first principles of defence, it does not care to go into the merits of the arguments; the effect on the British taxpayer is to make him button up his pockets. I trust, however, that John Bull will, on this occasion, keep his eyes open and see what the arguments of the gallant Admiral lead to. The average English citizen reads his daily paper, but does not have a very clear conception what a coaling station means, and if Admiral Colomb tells him it is quite unnecessary to fortify it he may say, "Well, the Admiral must know more about naval wants than a mere military man, therefore let us save the money." If, however, the same man is told that to follow out the Admiral's views, the citizen army, of which he is justly proud to be a member, must be disbanded as useless, he gives up his faith in the Admiral at once, at least on this question. I have only time to touch on a few points in Admiral Colomb's paper, and he has frankly invited the severest criticism. I may be allowed to express astonishment that with so bad a case so good a paper has been produced. The Admiral has given us leave to fire away, and no doubt he will stand heavier shot than I can bring to bear against him. I trust, however, that nothing I may say will be held inconsistent with the respect I feel towards the Admiral and the courtesy which is his due. It is surely a somewhat strange argument against the fortification of a port that once you begin you don't know when to stop, that as Admiral Colomb's naval friend, of whom I desire to speak in terms of the utmost respect, puts it, "there is nothing between a light battery and a first class fortress." It would almost seem as if the two gallant Officers, in their desire to run down the fortification of ports,

had wandered somewhat into the hazy regions of philosophy, and started a new theory of evolution analogous to that of the development of species, by which we learn that man has, by imperceptible gradations, been evolved out of a mollusc. Given a mollusc, and by process of development you must get the man if you wait long enough; or, as here stated, given a light battery, and in process of time it will develop into a first class fortress. Further on, the gallant Admiral seems troubled with a yearning after an ideal fortification, and on page 5 he writes, more, I hope, in sorrow than in anger, "No one has yet discovered or invented a fortified port capable of maintaining itself for all time against a sea attack." Certainly not. But is that a reason for abolishing fortified ports? This is logic with a vengeance—"No fortifications are perfect; imperfection is undesirable; therefore have no fortifications at all." I am afraid that even Her Majesty's ships and guns, down to our swords and bayonets, are not perfect, yet we must continue to use them. Admiral Colomb tells us that "fortification of ports is but an inefficient substitute for their naval defence." Now I beg to demur to this statement altogether, as fixed fortifications never can be regarded as a substitute, efficient or inefficient, for moving naval defence, which is what the Admiral means. On this mistaken premiss the Admiral infers that as we propose a naval increase we should logically propose a fortification decrease. I would, if I might do so without offence, beg to suggest the prefix "il" before "logically." The gallant Admiral frequently appeals to logic, but he will excuse me for saying that he is not always logical in his statements. Thus, at one part of his paper he states that he draws "a distinction between the defence of the port against attack and the defence of the communications of the port;" yet, further on, in the cases of Plymouth, Singapore, &c., he falls foul of the fortifications for not protecting the communications, which is surely no duty of theirs. He will not allow that five French battle-ships lying off Plymouth could bombard the Dockyard, even if it were totally unprotected with fortifications, because of the presence of ten English battle-ships at Brest, 200 miles off: yet in another part of his paper he admits that Malta Dockyard, supposing it were undefended, might be got at and destroyed in a few hours by a couple of dashing cruisers. One remarkable feature in this, noted by Captain Fitzgerald, is that the Admiral seems indifferent whether Plymouth is destroyed or not. On this point Captain Fitzgerald has already bombarded the gallant Admiral, and therefore I will say no more. He is compelled to admit that, "but for her fortifications Gibraltar would not now be our possession," yet goes on to assert that under present conditions they are useless. This seems to me playing fast and loose with the historical argument. Surely if naval history teaches us anything it is that our fleets were constantly losing local command and regaining it. If these periods of loss were short, the ports, if fortified, held out; if long, they fell; and by the Admiral's statement the periods for relief of blockaded ports would be much shorter with steam, so that fortified ports would have better chances of holding out. The gallant Admiral has endeavoured to show that the fortifications of Singapore are useless. Captain Stone, followed by Captain Fitzgerald, have ably shown the fallacy of his reasoning, but I feel on safer ground in quoting the opinion of Admiral Sir Vesey Hamilton, who stated in May last, at a lecture given by Admiral Colomb, "The great thing I had to fear when I was in China was this, that until the guns for the ports were sent out the Navy had to defend the ports of Singapore and Hong Kong. Now that Singapore and Hong Kong have got their guns and are defended, the Admiral in China is left free to defend his commerce." No more authoritative statement is possible. It comes from an eminent naval Officer, with all the weight of authority due to experience and the responsibility of command. He states distinctly that when ports are defended the Navy is free to protect the commerce, and I would wish that wherever Admiral Colomb's paper is read, this plain tale of Sir Vesey Hamilton's should be read also. One word more as regards the historical argument. Like Sir Lothian Nicholson, I cannot help fearing that the experience of former naval wars is an unsafe guide for the future, and much as I admire that spirit of confidence in the British tar, which has carried our flag victorious over every sea, I cannot help seeing some danger in it. The storage and protection of motive power must now control naval strategy, and I leave it to naval Officers to tell what a complete revolution steam has caused in naval tactics. History tells us that overweening

confidence has frequently led to national disaster in another generation. The glory of Frederick the Great was dearly paid for at Jena, and that of Napoleon the First at Sedan. Before I sit down I wish to add my protest against the notion which this paper rather tends to encourage, that there is any spirit of antagonism or unfriendly rivalry between the Army and the Navy ("No, no"), that the Army should be represented as in some way supplanting and robbing the senior Service. I do not admit that any such feeling exists in the Service to which I have the honour to belong. We are all proud of our Navy: we regard it as our first and most important line of defence. My experience has been that when we are serving together we do so heartily, and without jealousy or rivalry, working together as good comrades for the honour of Old England, and our wish, as that of all true Englishmen, is to see our Navy strong, and, if possible, mistress of the seas as of old.

Sir JOHN COLOMB, K.C.M.G., M.P.: In the few minutes which are allotted to each speaker it is really very difficult to cover the ground and at the same time avoid being misunderstood. I think the best hope of accomplishing the duty of discussing, without being misunderstood, in so short a time, may be to find some point on which we are all agreed. I believe that we are all agreed, at all events, upon this, that the title of the paper is the "The Relations between Local Fortifications and a Moving Navy." Now, of course, we may stray very far away from that; but there is another point upon which I think we are all agreed, soldiers, sailors, civilians, and all alike, that our moving navy must be sufficient to do its work. Then my next point is, what is that work? I think it may be thus shortly described—that its work is to paralyze the power of a hostile moving navy to do us great and serious mischief. Therefore the main issue raised by the paper appears to me to be this, to endeavour to elicit discussion, and, if possible, to scientifically determine what are the relations of our local fortifications to a hostile fleet, the power of which to do us great and serious mischief has already been paralyzed by the sufficiency and efficiency of our moving navy? Before dealing with the paper itself I would say a few words in attempting to criticize the criticisms that have been offered. In the first place, it is pointed out by our gallant friend General Erskine, that if we command the sea certain things will happen; but I take commanding the sea to mean that our moving navy is able to do its work, and if from the fact that the Navy is able to do its work, invasion is impossible, we cannot help it; and if public opinion, as the General said, won't believe it, even if true, we cannot help it. What we really have to do in this Institution is to endeavour to get at the facts and the truth. Then our excellent friend Sir Lothian Nicholson drew a very gloomy picture of the result of our moving navy doing its work; in other words, commanding the sea; he pictured the militia and volunteers twiddling their thumbs. That we cannot help. I must agree with him entirely in this, that our soldiers in this great Empire must do their work, but I assert they cannot do their work unless the Navy does its work first in commanding the sea. He said that as a military man he could give no opinion upon naval affairs, and he next, very kindly and good-naturedly and most courteously, hitched up his trousers, metaphorically speaking, proceeded to take the weather gauge of the meeting and to pronounce a naval dictum, which he afterwards explained—that the Navy had no history. Well, I understood him perfectly to mean that, in his opinion, we could not now rely upon history to instruct us with regard to modern naval war. I am sure he won't take it personal if I venture to think, in my own humble way, that he is entirely and absolutely wrong in that sense. I say, Sir, that steam has no more obliterated the teachings of history in the Navy than it has in the Army, and that the influence of steam in extending the area and possibilities of military warfare in land operations is quite as great as the influence of steam on sea operations. In obliterating the teaching of naval history, is he therefore prepared to obliterate military history? Now I come to the next speaker, who rather surprised me, Captain Stone, who said he did not advocate locking up our Army in detachments all over the world, but he did advocate all those places being impregnable. I confess I am puzzled at this declaration of the speaker. How can you get detached impregnable local positions without detached military forces? And I say that they will be locked up forces if we do not command the sea. The next matter I come to is this. He indicated in rather a depreciating way that we

must abandon the attempt to command the sea, for he said the command of the sea was a very large order. Well, Sir, the British position in the world is itself a large order and makes very large demands, and if we are to preserve our position in the world we must not shrink facing the demands that our position makes upon us. Then we had my cheerful friend Captain Penrose Fitzgerald, who plaintively informed the soldiers that in war they would not be in the hunt. I heartily agree with him, if Captain Stone's view be adopted, because they will have no horses unless the Navy commands the seas. Not a drummer boy can be moved. All I can say is, that the Navy is the covering force for the transport of the Army. Now, I come for one moment to a speech that was listened to, as it ought to be listened to, coming from the source it did—from Lord Carnarvon, and I confess that I thought it dealt more with the special question submitted to him in 1879 than with the question we are discussing here. I think it was unfortunate that a noble lord of his eminence should have publicly announced in this theatre that this Empire had in war only two things to do: one being to protect our own shores—the shores of these islands, and the other the protection of commerce. I protest against any Englishman leaving out of account the duties and responsibilities of this Empire with regard to her frontiers over sea, and our great Indian Empire. Lord Carnarvon, in concluding, apologetically remarked that if my brother's and my own views prevailed, we should require an enormous fleet. I should like to read to the meeting what Lord Carnarvon's opinions were, as Chairman of the Commission, as evidenced by the Report of that Royal Commission of 1879. Here is the Report. It speaks of "the necessity of maintaining, not only a fleet sufficient in number and in power to give *absolute security* to the sea-board of the United Kingdom, but also to provide fast vessels, so stationed as to be ready at the commencement of hostilities to deal with the enemy's ships in more distant seas. We, the Commissioners, feel bound to express our opinion, on looking to the action of other countries, that the strength of the Navy should be increased with as little delay as possible." I call the attention of the meeting to the words "*absolute security*" by naval means. Lord Carnarvon, in 1879, as head of that Commission, demanded a fleet sufficient to provide "*absolute security*" for our shores and for all our maritime wants. I will only say that, to take the reverse side of the picture, if you do not provide that fleet, this, to my mind, is certainly true—this Empire is gone, and the moral effect alone of the fact that your command of the sea is gone will extinguish all margin of possible profit, which means the closing of your factories, the shutting up of your industries, the cessation of the operations of your Stock Exchanges, your shops, and your counting houses. I say distinctly, in my humble judgment, it comes to this, that if your moving navy is not able to do its work, the position of some forty millions of people in these islands will be the position of so many rats in a trap. I agree with my brother in his main contention, and I think his paper was called for, because I am one of those that for many years have felt that while on the one hand in the past we were absolutely neglecting to give any local protection at all to our naval stores at different points, on the other hand, we have now swung round, and we are now too much tempted to spend too much money on, and to over-do local defences. I am not prepared to go quite so far as his paper appears to me to indicate, but I can quite conceive, putting myself in his position, and looking at the necessities of the time, that really in order to raise a distinct and clear discussion you would have to push your advanced posts of argument perhaps a little further than you might otherwise be inclined to do. Therefore I say, that while I agree absolutely in his main contention, he does go a little further than I myself am prepared to go. If we exclude all else but actual war-ships from the conditions of war I think I might be prepared to accept almost an extreme view; but I am not prepared to exclude from the conditions of maritime war all else but war-ships. I look at local means of defence, at naval bases, and coal depôts, as necessary to prevent the destruction of the docks, coals, and stores of our war and mercantile ships by raiders, because I think raiders are in this case your primary danger, and also the facility that steam gives for the rapid, certain, and sudden movement of troops from mercantile ports. I have said already I do not think steam has altered the conditions of naval strategy, but I think it has extended their application; and what it has done, and what I think is the most serious

modern element affecting our defensive position is this, that it has opened up and added to the problem of maritime defence, and has increased the power of improvised attack outside moving war navies. We, I think, of all nations must recognize that fact. I will take the case of Singapore, and I will point out that while I quite agree with the contention of the lecturer that it is useless to defend Singapore unless you are prepared to defend the local waters around it, I say that taking his illustration of the secure Singapore, and the colliers being captured outside, that is not so bad a position as the coals in Singapore being destroyed and the coals outside being captured also. I am bound also, in dealing with this question, to mention one illustration of history which I dwelt upon many years ago, namely, the case of the Mauritius. The Mauritius was held by the French years after the Battle of Trafalgar. It was found that it was a hornet's nest from which privateers issued, and it was determined by the Governor-General of India that this must cease as it was ruining trade. We really commanded the sea, and the Duke of Wellington, then Lord Wellesley, was sent to Ceylon with a large force of troops for the purpose of seizing the Mauritius. Admiral Rayner, I think, commanded the fleet to cover the advance of these troops on the Mauritius. A difference between the Admiral, who declined to go, and the General, who was ordered to go, brought matters to such a state that they had to abandon the expedition altogether, because the Admiral did not agree with it. So the ruin of our commerce in that sea went on; but later the naval authorities in the district found they must root this place out, and they sent a purely naval attack against the Mauritius, with a result that was terribly disastrous. Years afterwards we made a combined military and naval attack; we took the place. I point that out as showing that in all these matters in connection with naval bases you come at last to a combination between the Army and the Navy. That is very briefly my view. I cannot venture to detain you much longer, but looking at the duties and responsibilities of our whole Empire, and seeing what the action of the British public is, and that Parliament will not open its eyes, we are bound to fulfil the primary condition of our existence, that is to maintain the command of the seas; but having that, we are not to run away with the idea that we have then discharged all our duties and obligations. What I am most concerned in disputing is the exaggerated proportions of the modern doctrine of local fortifications for the release of our fleet. I think our true safety lies in this: that our docks, stores, coals, and offings must be locally secured against raiding attacks, that our Fleet must command the sea by being strong enough to paralyze the power of hostile war fleets, and thus to secure the release of our Army for defence of our frontiers abroad and for descent on the enemy's coasts.

Major WALKER, R.E. : I shall be glad to be allowed to join in the congratulations to the lecturer for his very able paper—a paper, in fact, so able and so clever that it has almost persuaded Admiral Colomb himself against his better judgment. I will read the two last lines of Admiral Colomb's lecture, in which he says: "It is a mere instinct with me which admits light batteries at the entrance of our ports. I cannot, when I face it, reconcile their existence to my reason." In his lecture Admiral Colomb has constructed a keen logical weapon for the overthrow of fortifications; but he has not convinced us. In his last lines he admits light batteries for the defence of commercial ports. I think that he has written two lines too many in his paper. In a previous page Admiral Colomb says there is nothing between a light battery and a first-class fortress; so that we are to have a first-class fortress for the defence of every commercial port! What, in Heaven's name, then, are we to do for the defence of Plymouth? I think that is a point that Admiral Colomb ought to answer. Then there is another point. General Erskine stated that the lecture practically amounted to this, that we must disband our land forces and dismantle our fortresses. The lecturer dissents from that; but Captain Fitzgerald told us in very forcible language that, "You are out of it; you are not in the hunt, you soldiers. The first shot fired by a volunteer in anger means not the commencement of the decadence of the British Empire, but its complete destruction." That, I think, is letting the cat out of the bag rather as to what the meaning of the lecture is. It means practically the complete destruction of fortifications—that we do not want any fortifications. Now, although another gallant Admiral told us that we had a glorious military history, I do not think that that glorious

military history will make up to us soldiers for having lost all present usefulness and all hope of future distinction, which we have lost, if Admiral Colomb's lecture is sound. Captain Fitzgerald put it very plainly. He said, "You have India; you are a *dépôt* for India; but you are nothing else; you are merely a *dépôt* for the defence of India; that is your only hope, your only *rôle*, for the future is to defend India." I admit that the defence of India is a very glorious task, but it is not the defence of the British Empire. We have sailed with the Navy all round the world; we have, in company with the Navy, swept the seas around the world in the acquisition of the British Empire, and I do not think we want to give that up yet. I think Admiral Colomb has rather created a structure which he then proceeds to demolish, and in the ruins of this child of his own imagination he has hoped to bring down fortifications also. He says Captain Stone's third line of policy is this: "The third line of policy is that sketched by Captain Stone, if I rightly apprehend him, namely, the dispersal of the Army all over the world in detached garrisons;" and then at a later part of the lecture the Admiral gives us his own views. He says, "There remains the third function of fortification, namely, the protection of the stores—the protection of the *dépôt* proper, and not the shell of it—from the sudden surprise and destruction which might be effected in a short time by a small force." Then he goes on to say, "The original claim for the local defence of our coaling stations did not go further than this." But supposing that Captain Stone did make that proposal, did propose that policy—I did not clearly catch what Captain Stone said, but I believe he said he did not intend that—but supposing he did intend that as being the one line of policy, has anybody adopted it? Have the authorities who are responsible for the defence of the Empire adopted it? Certainly not. There is no such idea. The defence that is now being carried out is practically a minimum defence. We have actually adopted Admiral Colomb's own idea altogether. We have no other idea; we dream of nothing else. I do not imagine that the fortifications of coaling stations are to go stalking over the sea and contending with the enemy's cruisers. I contend the defence of a coaling station is to be what Admiral Colomb wishes it to be—purely local defence for the protection of the stores and of the stations themselves. There are some other points I should like to mention. There is a minimum defence, and when Admiral Colomb speaks of a large expenditure on gigantic works of defence, I very humbly think that he must have had in his mind the British line-of-battle ship, which is the only gigantic defensive work that I know of, the only one that can at the present moment cost any very large sums of money. Our work does not cost very large sums of money, for the very simple reason that we do not get very large sums of money to spend upon it.

Captain FITZGERALD: Where do the 16,000,000*l.* go against our 12,000,000*l.*?

Major WALKER: It is impossible for me to answer that point without notice. I have only been able to pick out a few points, and, for reasons that will be obvious from the position I hold, I have carefully avoided figures. I might have been told that I was trenching upon things with which I had no business to interfere: therefore I must ask Captain Fitzgerald to allow me not to quote figures. Take Singapore. Captain Fitzgerald has pointed out that Admiral Colomb assumed too much when he assumed that a squadron, after having coaled, had exhausted all the benefits that can possibly be obtained at Singapore. Captain Fitzgerald pointed out that there would remain a large quantity of coal still safe. I am trying to get at the relations between fixed fortifications and a moving fleet. You have there a quantity of coal: your fleet coals up, and, I presume, would have to go away to carry out their proper business. You evidently intend that the fleet is to go away from Singapore; but if there are no fortifications there a fleet cannot go away: the fleet must stay and protect the coal. On the other hand, if the port is protected by a few light guns, the fleet will be at liberty to go away and follow its own vocation of protecting commerce; and although the enemy's cruisers may, and no doubt will, interrupt the supply of coal, still they cannot destroy the coal already existing in that port.

Captain FITZGERALD: May they not take the coal with them?

Major WALKER: That I leave naval Officers to say. My point is that there will be some left to protect, and you must have something to protect it. That is the

minimum defence; but there must be some defence, or you will lose your stores. I am now looking at it from a naval point of view only; but is there nothing on the sea except Her Majesty's Fleet? Is not the primary reason of the existence of Her Majesty's Fleet the protection of the trade routes and of commerce? And if the fleet goes away and leaves Singapore undefended, what will happen? If it leaves it defended, then a commercial vessel, chased by cruisers and hampered by the enemy, will run into Singapore and obtain shelter under its guns. Will it not be better, when Her Majesty's ships come back to Singapore after their cruise, to find instead of a line of blackened hulks along the shore, a line of trim merchant vessels lying at anchor safely under the guns? I think there is a case in which the existence of fortifications does free a fleet. There is another question—about Malta. Admiral Colomb admits the necessity for the fortifications of Malta: he admits the importance of the dockyard of Malta, and he appears to me only to object to its being any further strengthened. I so read the paper. There is a very small amount of work being done at Malta at a very small cost. The fact is—and I think I may say so much without saying anything wrong, or revealing any secrets—that the opinion of every Officer who is officially, or ever has been officially of late years, resident in Malta, is that this slight increase is not only a good thing but an absolute necessity, if the place is to be defended. Then can you for a moment say that this slight addition shall not be made to a fortress to bring it up to equality with modern armaments simply because it now needs a large fleet to take it? I do not think it does need a large fleet to do it any damage. There is another point about Malta. It is said that no port could ever resist an attack from the sea. Upon that I will simply name Cronstadt and Sebastopol. Again, Admiral Colomb asserts no attack is possible where there is any fear of interruption from the sea. I take the Admiral's own instance—Tobago—where an attack was successfully made under cover of a fleet; but can you say you will never lose the command of the sea locally to some extent, as you did at Tobago? There, again, is the case of Trincomalee. Then there is the case of Gibraltar. Surely the case of Gibraltar is clearly in favour of fortifications. We regained the local command of the sea, and Gibraltar was relieved: we lost it again, and Gibraltar was again attacked. Now, had not Gibraltar been fortified it must have fallen. The possession of a fortress does *not* follow the command of the sea. The French held Malta for two years after we regained possession of the Mediterranean—and Malta is an island. If Malta had been on the French mainland how long would they have held it? If Malta had been to France what Gibraltar is to Spain the French would have held it for ever. We could never have regained it simply by regaining the command of the sea. I may say, in conclusion, that the question which strikes me as being one of common sense simply amounts to this. You say we want the command of the sea. We all admit that the British Navy is our first line of defence, and it must be made as efficient as possible. What does the command of the sea mean? Is it possible that anybody can stand up here and say that he believes that a fleet can be made so strong that it shall at all times, in every sea, off every port, on every trade route, be invariably superior to all possible attack? If it be, Admiral Colomb's case is proved; but I say common sense answers "No;" and I say that my contention is proved by the fact that now, in time of profound peace, we are in a condition in which we are admitted—not by general opinion, but by the opinion of experts, of people who know, to be behindhand—to be so much behindhand with our Fleet, that it needs a sum, variously estimated, from 12,000,000 £. to 100,000,000 £. to put the Fleet on an equality with what? With the Fleets of any two Powers—supposing that we have two Powers combined against us?¹

Colonel FRASER, C.M.G., R.E.: There is one point on which all seem to be agreed as fully as we are all agreed on the importance of strengthening the Navy, namely, on the patriotism that has animated the lecturer in bringing forward the subject. At

¹ Since the lecture the Fleet has been declared *officially* to require an expenditure of 12,400,000 £., beyond the ordinary expenditure in the next four years, to bring it up to its proper relative strength; and does even this satisfy naval Officers? Where then is Admiral Colomb's perfect Fleet?

this stage there is less to be said, because naval speakers have expressed dissent from what, if an old friend will permit me to say so, are the more startling eccentricities to which he has given way. I will not, therefore, touch on more than one or two points. First, as to the origin of the defence of naval ports. Admiral Colomb seems to think that we adopted the practice from want of thought and have stuck to it through obstinacy. That line of argument would, I think, be equally applicable to the creation of the British Navy: we borrowed the ark from Noah; and since then we have borrowed ironclads from the "Merrimacs" and the "Miantinomas" and other monsters:¹ and we all go on building ironclads of new types, knowing full well that they are destined to be obsolete. We do this, not to cover our past follies, but because we do not know what on earth to do better to anticipate the future. I confess I think the simpler solution of both these questions is that defended ports and ironclads are the outcome of our necessities and, in the development of species, they mark this "survival of the fittest." The lecturer has based his arguments on naval history. There are few things history will not prove or disprove, and I should like to touch on one example he quotes, all the more pertinent because it is one that has happened in recent times and with ironclad fleets. He points out that in the war of 1870-71 an Admiral on one side, with all the freedom of an undefended base, and with an enormous naval preponderance of force, was prevented from bombarding a town on account of the presence, I should have said absence, of a very inferior hostile fleet, 700 miles away. Now, if a General on land were under similar circumstances, similarly deterred, we should, I think, say that General was "unfortunate." I am quite prepared to admit that there may have been naval reasons for the Admiral's inaction that a landsman cannot fathom. But if there are, then I venture to say the teaching of history in this case is this, that the best way of strengthening the British Navy would be so to reduce its strength as to secure to it that preponderating influence over all superior forces that, judging from this example of history, an inferior force seems to possess: I say to reduce its strength; because if an inferior force can always restrain a superior force from taking action, then you will best strengthen the British Navy by so reducing it that it will always exercise the restraining power over its superior enemies that this fleet of Germany is said to have exercised over the French. In fact, according to this example, a small fleet of ships at the Hebrides will protect Great Britain and Ireland. I only mention this as an example of the teaching of history. I think you fancy I am not an interpreter of history. I agree with you in this instance at all events. Rather than accept such a conclusion it would, I think, be a race between you and me and the lecturer to throw this particular Admiral to the whales and to send history to Saturn, a place where I am told a *dépôt* has lately been started for conclusions which have ceased to agree with our own. Some people have been trying, I will not venture to say to frighten the Admiral, because in his case that would be impossible, but they seem to have made him "very uneasy in his mind, with gruesome pictures of vast fortifications round London, of a vast line of fortresses round these again, and so on to the coast, the whole defended by vast armies of the Continental type; and, worst of all, of a simple-minded Chancellor of the Exchequer led into wrong paths when he ought to be following what, we agree with the lecturer, is the better way." Now most of us know a bogey when we see it except, apparently, the lecturer, and I venture to say this is a very pronounced bogey indeed. It reminds one of certain figures one sees at fairs, that are put up for the express purpose of being knocked down again. The inventors of this bogey have drawn on their imaginations for their facts. Those who govern this country have all the facts before them. I only wish to goodness the public were as cognizant of these facts as the Government must be. If they were, I think the interest in the strengthening of the Navy would exceed all other interests at present. No doubt the Government, with every means of judging the

¹ Defence on land and sea has alike undergone great changes since 1862, but the fortifications of Portsmouth and Plymouth are at least as efficient for the defence of those places from attack as are ships of the "Warrior" class to take a place in the line of battle.

merits of the question, and with a weight of responsibility which we have not, will best decide what measures are to be taken on land, and what is to be done at sea. If I may venture to make one broad criticism on this admirable lecture, in which, if there is a good deal of quartz, there is not a little gold, it is this: you do not improve the case of the self-evident and the unanswerable by piling up arguments which, on the authority of naval speakers, appear to be not only answerable but in their opinion untenable. And to the bogey-mongers I should like to say, you do not heighten the effect of a picture by throwing dust in the eyes of those whom you wish to admire it, and to be influenced by it. I next come to the remarks made by a most genial speaker and already noticed by others. Captain Fitzgerald has settled a little side issue, namely, that connected with land defence. He has pronounced authoritatively, *ex cathedra*, that we are "not in it." Well, it would be uncourteous to say that there is a difference between assertion and argument, but let us see what he asserts. We do not want to set up a bogey, but to state as fairly as we know how the contention that he and others have put forward as unanswerable. It is, I think, contended, first, that invasion is absolutely impossible unless and until our power at sea is completely and once for all destroyed past all recall; second, that no one will take the trouble to invade us because they can starve us out. We all agree that when the Navy is put in the supreme position in which we desire to see it, then we may hope the seas will be as safe as in peace-time, and the idea of invasion will be absent from our minds; that in the meantime if our Navy be gone completely and past recall our Empire will have gone with it; in which case there will be little left to live for, not to say to fight for. And it would only remain for the "unfittest" half of our population to set to work and die off at once. I am not a panic-monger, but, while I think the contingency of invasion to be remote, it does seem conceivable in a state of things considerably removed from such a dreadful cataclysm as the entire annihilation of the British Navy.

Captain FITZGERALD: No.

Colonel FRASER: That is a very fair difference of opinion. We have been told that in these questions the appeal is to history: to history let us go. At the beginning of this century we were supposed to be supreme against the fleets of the world. We had fewer rivals to oppose us; less territory and fewer seas to hold than now; no coal to think about, and relatively to our strength a larger number of ships to be "everywhere." At that time naval affairs entered much more into the life of the people in this country than they do at present. The population of these islands was about half what it is now, and yet the people of England thought it necessary to maintain a total of something like a million of fighting men. If in the opinion of our forefathers at that time invasion was possible, are we wise in coming absolutely to the conclusion that it is entirely impossible now? As regards the military possibility of the operation, the greatest master of war the world has ever seen thought it feasible; and the General who defeated him has recorded his agreement in that opinion. What were the conditions in 1805? Armies were slowly organized, more slowly concentrated by road. The northern coast of France was not then provided as now with great artificial harbours. The floats that it was intended to use were little better than those in which Cæsar and the Tenth Legion successfully made the passage: and the difficulties owing to their being dependent upon wind or oars were very considerable. What is the state of the case now? The north of France is provided with vast and commodious harbours, the last of which was opened, I think, only two or three days ago, and in those harbours there are always great numbers of steamers that can, as the lecturer has pointed out, move with a certainty that was unknown before steam, and can cross in a few hours, while we all know the rapidity of modern mobilization. Lastly, the lecturer has given it as his opinion that Napoleon's failure was due to Villeneuve's want of nerve. It may be so, and that if the great leader could have inspired that broken reed, as he inspired his soldiery, the attempt might have been made; but there is one lesson that we cannot, I think, draw from history: it is that what the incapable have failed to perform in the past the capable will alike fail to perform in the future. If we disband, as Captain Fitzgerald suggests, I think we increase at once the temptations to invasion, and invasion itself will be possible with largely reduced numbers, while we should be incapable of those offensive returns by which our

Empire was won, and by which alone we can close with an enemy we cannot starve.

Captain FITZGERALD: I never suggested disbanding.

Colonel FRASER: In the event of certain contingencies, I would ask how do we stand at this moment? Are you prepared, or are you not, at once to safeguard Britain, to secure the Greater Britain, and to hold our trade roads everywhere at sea? If you are, why do you, as we think rightly, ask for an augmentation of the Navy? If you are not, what are you going to do for some years to come? Are you going to palisade England with a floating boom of ships and leave our commerce to our enemies? In such case, while you save us from them we stand to lose the Empire by which we live. I do not presume to say how you will do the best you can to safeguard us everywhere; but you will doubtless try. Meantime this is not, I think, the moment for putting aside the terrestrial string to our bow; nor until we get a bigger basket should we put all our eggs into one. While we put our faith in the British Navy I think we ought to keep our powder dry on shore. Finally, is it so certain that nobody will take the trouble to invade us because they can starve us out? There is a wide difference between the starvation that would follow your annihilation, and the ups and downs of a protracted war, in which our commerce may often be interrupted as it has been before. This country, where economic laws now impede cultivation, can, at need, feed a larger population than in 1805. Unless all our ports are effectively blockaded neutral ships can come in. While the success of blockade running, even if for a moment we come to that, points to the influx of much food at the worst. The starvation bogey has, I think, been exaggerated. In the autumn we have six months' supply in this country to carry us through the winter. It has been suggested we should have bread, but our people could not buy it. In such case, not to take higher ground, it would be cheaper for us to put the Poor Law machinery into motion rather than to pay five times five milliards and hand over our Empire, including the British Navy. If Nelson has a successor he will lead you sometimes to Copenhagen—to Aboukir—to Trafalgar. Doubtless you will have ships in narrow seas as well; and we would expect you to beat your enemy as of old; but none of us, not even the most inexperienced, can predict with certainty the result of every naval fight; because none of us know which ships and what methods will prevail. We have to think of the stakes that other people will be playing at. Each side will strike with its strongest arm. We cannot crush, say France, on land, on account of her immense armies, nor can we starve her out. On the other hand, the capture of London would terminate an otherwise interminable war, would transfer our Empire to our enemies; and last, but not least, among the moral factors that control the acts of men, such a dramatic success might be attempted as the only means of perpetuating the dynasty of a dictator.

Admiral the Right Hon. Sir J. C. D. HAY, Bart., C.B.: I have learned so very much from my friend Admiral Colomb on former occasions that perhaps he will forgive me if I cannot on this occasion thank him so much for his paper, at least for the information it contains, as I would have expected if I had not heard the paper. The advantage of the paper has been the discussion which it has elicited, and, I believe, that was the object he had in view. My gallant friend began his paper with a historical fallacy, because he speaks as if an invasion was something which could not possibly be anticipated. I would only say that the shades of William the Conqueror, or Henry Tudor, or Dutch William would contradict that assertion. I believe that this country has frequently been successfully invaded, and that it might be invaded again. I am one of those who think that it is open to invasion and that such a thing is possible—I hope it is not probable. I may say that when I seconded Sir Frederick Smith's motion in the House of Commons against the expenditure of 14,000,000*l.* on fortifications, which I think was a very considerable sum, whatever Major Walker may say, I did so, not on the ground that I did not think it desirable that Portsmouth or Plymouth should be fortified, although at that time I did prophesy that the forts would not probably be completed or armed for a very long time, and I believe I was tolerably accurate in that supposition, but it was because I thought that Filey or the Black River in Essex, or Pevensey Bay, could not be defended by the forts at Portsmouth, and that a great fleet is necessary for the protection of our shores and for the prevention of invasion. I understand Admiral

Colomb's paper to mean this. If the amount of money to be spent is limited, first of all complete your fleet. I go with him as far as that. But to say that fortifications are useless is against that ancient history which my gallant friend referred to, but as to which he, in the meaning in which he uses it, is in my opinion wrong. When Lord Nelson or Lord St. Vincent blockaded Cadiz, why did they not destroy the Franco-Spanish fleet? Because Cadiz was fortified. Why did Lord Hood take possession of Toulon—though an ignorant Secretary for War and First Lord of the Admiralty who were civilians did not support him when he had possession of it—why did he make that the base of his operations for a considerable time? Because he had got at the French fleet, and because the fortifications of Toulon were not at that time manned to oppose him. As soon as they were manned to oppose him he was turned out of Toulon and lost his base of operations. I agree with the last speaker that what we want is a strong Navy, and I disagree with him in thinking that you cannot get a sufficiently strong Navy for the purpose. I think he stated that at the beginning of the century we had conceived it necessary to have a sufficient fleet. We had, on the average, 146 sail of the line always at sea, or ready for sea, in addition to a number of others which were not available. And when we were not superior to the whole of Europe we took possession of the Danish fleet in 1807, and then made ourselves superior to the whole of Europe, and a very good thing too, I think, and I am glad it was done. It made us superior for the rest of the war, and if we had done it earlier in the war, if we had kept Toulon and had seized all the fleets that might have been opposed to us, as we did the Russian fleet in the Tagus and the Danish fleet, we should have had the command of the sea as we had from 1807 until about 1840. I am not entirely hopeless that the country might rise to a great spirit of indignation, and may say that for every battle-ship which is opposed to us we shall have one here—that we shall have ship for ship against everything that could possibly be brought against us. The gallant Officer who preceded me seems to think that their days are numbered; in the meantime other people have got them, and we must have them also whatever they cost. I agree that until our fleet is made sufficient for that purpose we had better not spend money largely upon new fortifications. Those that we have ought to be armed. Those coaling stations which have been recommended to be fortified should be fortified against raiders and cruisers, and the sooner the better. I trust that when my honourable and gallant friend the lecturer stands up to reply he will put on a penitential sheet, or will, at least, tell the meeting that he has been humbugging them.

General Sir J. LINTON A. SIMMONS, G.C.B., G.C.M.G.: The paper which has been read to the meeting by Admiral Colomb is one of very great interest, but I think he has gone a step beyond what his conscience would dictate to him as the proper thing. He has done it, I have no doubt with the best of intentions, to elicit discussion. But the question as it stands at present is one which is rather of an academical than of a practical character. My reason for saying so is this. If the fleets of Great Britain are sufficient to maintain absolute supremacy on the seas in all parts of the world, so that it would be impossible for hostile ships to come near us and annoy our ports, and levy contributions from our towns, and destroy our coaling stations and commerce, then I say we want very little more. The Army would in that case have to defend our land frontiers in India, Africa, and America, depending upon the Navy for the safety of their communications, and would not be necessary for the defence of these islands. But I should like to ask, Is the fleet in that condition? (No.) You all say no; and I believe myself it is in a very unsatisfactory condition for the performance of that great function. Having lived in a naval port for some years, I have observed that the Commanders of ships of war, even in peace-time, when they are not compelled to keep the sea in all sorts of weather, and have not an enemy to meet, are very glad on coming into port to find a dock in which their ships can be refitted and repaired before going to sea again. The wear and tear of ships of the present day is very great. That is the experience that I have gained from living in a naval port for four years; ships of the present day require constant attention and of such a nature that the repairs cannot be done by the ships' companies themselves, but must have the machinery for effecting them. That being the case, coaling stations are not only of use for coaling purposes but they are re-

fitting stations, of the greatest importance to the Navy. Setting aside the question of coal, if a hostile cruiser could get into a port in which you have the means of repairing ships, and could destroy those means, it would seriously affect the efficiency of the Navy. For instance, let us consider the Mediterranean. A ship that wants repairs in the Mediterranean has only one port it can go to for them, namely, Malta. If Malta does not exist as a repairing port, where is the nearest port? It is in Great Britain, in the United Kingdom. Can you afford to be sending your ships home all that distance to get those repairs which are necessary? If you are compelled to send your ships these long distances to be repaired, you will require many more ships to keep up a blockade or to observe an enemy's ports. Now, with regard to the sufficiency of the Navy for the purposes which I have indicated, and for which it ought to be maintained, we have the strongest evidence as to what is necessary. A Report has been published within the last few days, signed by Admirals Sir William Dowell, Sir Vesey Hamilton, and Sir Frederick Richards. What is it that these Admirals, not discussing in this theatre, but having a due sense of responsibility, having studied the subject closely, and seen a great deal of evidence—what is it that they report? And remember that the Blue-books contain only extracts from their Report; there are probably many things in the Report itself which cannot be published to the world. It is very difficult to discuss these questions fully in public, because there is a vast deal of information which cannot be placed before the world. I say this advisedly, having been a member of the Commission of which Lord Carnarvon was President. We were for a long time occupied in taking evidence, some of which was given to us under a strict bond of secrecy, which is possibly the reason why that Report has not been published.

Sir J. C. R. COLOMB: I quoted from the published Report which appears in the Appendix of the Colonial Council.

Sir LINTORN SIMMONS: But I believe the whole of the Report has not been published. I was not aware until Lord Carnarvon alluded to the passage in that Report respecting the Navy that any part of it had been published; certainly the evidence on which it was based has not been published, and I suspect that similarly a great deal that was before these Admirals could not properly be published. It would be as unwise to publish the facts upon which the defence of this great Empire depends as it would be for the Germans to publish all the schemes of attack and defence across their frontier upon which their great system of defence has been determined. I will go back to the recommendations of the Admirals. They say: "It is not necessary to point out the incalculable mischief that so enterprising an enemy might inflict in even that short time (that is about thirty hours), and how imperative it is to complete the military defence of our great commercial centres without further delay." Towards the end of their Report they say: "It would be far more in consonance with the requirements of the nation by the provision of an ample fleet to render invasion an impossibility, than to enter into costly arrangements to meet the enemy on our shores, but under the conditions in which it would be possible for a great Power to successfully invade England nothing would avail her, as the command of the sea being lost, it would not require the landing of a single man upon our shores to bring her to an ignominious capitulation, for by her Navy she must stand or fall." Now, I believe myself that the Navy is the first and most important line of defence. We can do nothing without it; everyone in this country must be of that opinion. But I do not quite subscribe to the opinion that because the Navy might have been worsted for a time in any particular sea the country is to be invaded or reduced to subjection by starvation. I believe that our Navy will be distributed in various parts of the world. It will not be all in one great fleet, and one great battle will not decide which is to be the prevailing Power at sea. Supposing a fleet blockading Brest or Cherbourg, or any other port, were worsted, and it is quite possible that it might be worsted, because it would be fighting under unfavourable conditions in comparison with the enemy, whose ships being in port would be free from wear and tear and not liable to loss, whereas the blockading fleet would be subject to the raging of the elements and to accidents, and would be kept continually at hard work with a large amount of wear and tear going on—supposing under those circumstances that this fleet were worsted, it does not follow that all the other fleets of Great Britain in other seas should be worsted likewise; and it does not follow if there are naval

ports secured by fortifications, for the time that those fleets could not find their way into them and that they could not be brought together and reinforced; so that there is no reason why we should not resume the supremacy, that is to say, provided that we have a sufficient number of ships. But, in the meantime, while this assembling of the fleet was going on we certainly might be exposed for a time to great danger on the shores of England. This danger may be of various sorts. If it were intended to subjugate the country, a force of from 150,000 to 200,000 men, or perhaps more, might be required; but what should be said of an invasion with 10,000 men, accompanied by such measures as those which would have accompanied the invasion had it taken place in the time of the First Napoleon? I looked up, the other day, what Napoleon himself stated with reference to this question. He said: "The *canaille* of all nations are nearly alike, I would have made such promises as would have had a great effect—the proclamation that we came as friends to relieve the English from an obnoxious and despotic aristocracy, together with the proclaiming of a republic; the abolition of the monarchical form of government and the nobility; the declaration of the forfeiture of the land of such of the latter as should resist, and its division amongst the partizans of the revolution; and a general equalization of the property, would have gained the support of the *canaille*, and of all the idle, profligate, and disaffected in the Kingdom." If 10,000 men were disembarked on the coast of England, their numbers might be magnified tenfold. I do not mean to say they would bring about a revolution, but if revolutionary documents such as Napoleon designed were scattered broadcast throughout the country, and all sorts of promises made, I think some of the gentlemen who frequent Trafalgar Square would only be too delighted to throw in their lot with the invader. The whole of these questions depend on the possibility of the Navy doing the work which the gallant Admirals describe as their duty. The Admirals in their Report said: "That the Channel Fleet (so called) should, supposing the enemy to be a great maritime Power, be of sufficient force to blockade the fleets of such Powers in their ports or to bring them to immediate action should they put to sea." That is the first requisite, but what does it imply? It is just as necessary, I presume, to blockade (speaking subject to correction in the presence of so many Admirals) not only the fleets in the home ports of the Powers with which we may be at war, but their fleets also that may be in the China Seas, in the Mediterranean, or on the coast of Africa, or anywhere else. This involves a very large force, and then there is another thing: history tells us the enemy's fleets have not always remained in their own ports, and it is possible for a large fleet to be detached before the commencement of war to a neutral port, in which case they could not be blockaded, because by doing so you would bring upon you the hostility of the Power to whom the port belongs. (No.) If you attempt to blockade a ship in a neutral port you are liable to bring upon you the hostility of the neutral Power. (No.) Whether that be so or not this Channel Fleet will have to be of immense dimensions; the Admirals state in the proportions of five to three of battle-ships alone to blockade the enemy's fleets, which I take to be the object wherever they may be. Therefore it would be a fleet, the duties of which will extend beyond the Channel, even to the Chinese Seas. That is the first batch of vessels required, namely, the so-called Channel Fleet. The Admirals then go on to say: "There should always be an effective Reserve Squadron, absolutely confined to home waters, sufficient to hold the Channel and protect the coasts and commerce of the United Kingdom." That is a rather large order; it evidently points to the possibility of the blockading squadrons not having been successful, and that hostile fleets may be on your coast, otherwise this Reserve Squadron would be of no more value than it is contended the fortifications for the defence of harbours are, because, in fact, if your blockade be perfect, the enemy can never come near the coast to bring this Reserve Squadron into action. Then comes a third lot: "in addition to the district coast defence ships which would be necessary for active local defence on the coast of Great Britain, Ireland, and the Channel Islands." The above constitute three requirements. The fourth is: "that there should then remain available a sufficiency of battle-ships and swift cruisers to reinforce our squadrons abroad to the necessary point of superiority with reference to the requirements of each station, for the formation of detached squadrons and convoys for commerce and troops over and above the number required for home and

Mediterranean service." That again is a pretty large order. And, fifthly, "an ample reserve to meet the waste of war." Now I do not mean to say any one of these five requirements is not necessary, but this I do say, that I believe, subject to correction, that your fleet at the present moment scarcely fulfils the first of these conditions, and before you get these five requirements complete, years must pass and a vast expenditure must be incurred. The Navy has been let down to that low point that it would require a long time to bring it up to the strength considered necessary by these three Admirals, men of great experience, who having before them the reports and opinions of other Admirals have, under the weight of responsibility cast upon them, stated their opinions to the country; it is of importance that this should be borne in mind; at the same time, and certainly for the years that must elapse before the fleet can be brought up to this strength, I cannot subscribe to the theory that fortified coaling stations and defences for large mercantile ports are not necessary. The lecturer has made allusion to Gibraltar. What are the facts? It is quite true that the Army alone cannot hold it for any great length of time without support. We, the Navy and Army, must work together. The communication with Gibraltar can only be secured and its revictualling carried out by the Navy, but in the absence of the Navy the Army can hold it as long as the provisions for its garrison last. What was the use of Gibraltar on one memorable occasion? After the Battle of Trafalgar Admiral Collingwood took his fleet in there: he was very glad to find a port near at hand where he could re-fit and repair. The converse happened with Admiral Dumanoir, who made his escape after the battle with four or five line-of-battle-ships, and was met by Sir Robert Strahan on his way to his port 600 or 700 miles distant. If he had had a port under his lee, or within 200 miles, he would have got into it in safety and so preserved his ships. What happened as regards Malta? It entered into Napoleon's designs to get possession of it. He went there, and in the course of two or three days the garrison got frightened, or rather there was treachery in it, and they surrendered; but if there had been a British garrison there no doubt Malta would not have surrendered, and it would have been secured to Nelson during his operations against the French Admiral. These are points which have to be borne in mind. Then, again, reference has been repeatedly made to Singapore. I think the necessity for the defence of Singapore by fortification is evident, it being very distant, in a position in which trade concentrates, where there is necessarily for commerce a very large accumulation of coal. I know at one time there were 140,000 tons of coal collected there merely for commercial purposes; well, a large dépôt like that is of great use to the Navy as well as to the commercial marine. If there were some moderate defence there to keep off such a squadron as is likely to attack it, Her Majesty's ships having coaled there and gone to meet their enemy, might feel assured that on their return they would find not only coal but machinery to repair their engines and assist them in putting their ships into a proper state of efficiency. I think these are grave considerations, and I may say this with respect to Lord Carnarvon's Commission, that it endeavoured, under the deep sense of responsibility which rested upon them, to minimize the defence of coaling and refitting stations to the utmost. We had to consider, in the case of every port which was proposed to be defended, the nature of the attack to which it would be exposed, and the means available in the place for the assistance of the troops. That was done most amply in the case of all those ports, and I believe the defence of each was minimized to the utmost. It is not a question of millions of money, and diverting these large sums, as has been stated, from the Navy. The amounts proposed to be expended were not so very large, and I believe that the expenditure that was recommended is absolutely necessary, not only for the ships of the Navy, but still more if possible for the commercial marine. I do not know that I have much more to say on this subject. I think perhaps you may consider I am riding my hobby-horse to death in saying it, but it appears to me that the whole of this discussion points to one thing: we in the Army and you in the Navy are two separate departments working for one purpose, that purpose being the defence of the Empire. We are all deeply interested in it. I should be very sorry to say one word, or see anything done by military men which would derogate from the efficiency of the Navy, or retard its being made much stronger than it is. But my experience in years past has been that there is a pulling and hauling on the part of the two Services to get

as much as they can out of the Chancellor of the Exchequer. We see the defects of our Service, naval men see the defects of theirs, and we each try to get as much as we can, and it is our duty to do so, to make our respective Services as efficient as possible; but I do not think that there is that combination of the two Services for the one great object that there ought to be, and I believe the true method, by which alone the measures that should be taken for the defence of the Empire as a whole can be properly settled is that there should be a Minister for Defence, for War if you like to call him so, and that the two Departments shall be subordinated to him; one Cabinet Minister and two others, not necessarily Cabinet Ministers, subordinate to him, each responsible to the country for the efficiency of their respective Services. I have been attacked as to my ideas being Utopian, but I am happy to see that a good many provincial papers have taken up my views. My idea is this, that the question ought not to be a political question; and that there should be a few good men, whether you call them Commissioners or whatever you may choose to call them, under a Cabinet Minister, who will consider such questions and work them out as a whole. If Imperial defence had been properly worked out as a whole, this discussion would not have taken place, because the question raised by the lecturer would have been under the sense of responsibility attaching to each individual who had assisted in working it out. Then I go a step further, and say that the Minister under whom such a project had been elaborated ought in some way to assist in seeing that his project is carried properly into effect. A question was asked by Sir John Adye in a letter to the "Times," whether it was reasonable to place an ex-Minister as an assistant to a Minister in office. I can only say from my heart that I believe it is unreasonable to suppose that the public men of England have not sufficient patriotism in them to work upon a non-political question, involving such vital interests to the Empire, in perfect harmony. All that I can say is, having served on Lord Carnarvon's Commission where there were men of divergent politics representing different political parties, that we worked in perfect harmony and brought our Report to an unanimous conclusion.

General SHUTE, C.B.: As I am Vice-Chairman of the Brighton Branch of the Naval Volunteer Defence Association, and having taken a considerable interest in this subject, I am extremely glad to have heard the very able lecture of my gallant friend, in most of which I fully concur, though I feel that he somewhat rode his hobby to death. The Army and the Navy, since the days of our being so closely associated in the Crimean War and up to the present time, have become more than sisters. We are twin sisters, and most affectionate sisters. Now, as regards what the gallant Admiral has advanced, I also am perfectly satisfied that the defensive wars of this country will, and indeed *must*, be fought on sea and not on land. I am perfectly satisfied, however, that the Army and the Navy must work hand-in-hand if England is to remain a first-class Power. The fact is, I am satisfied that this country will never be invaded. It ceases yearly more and more to be self-supporting, and thus partial investment seems more and more its chief danger. Now I do not for a moment deny that it is perfectly possible to invade England. I know of 50 miles on our south coast where I could select three or four places where with perfect certainty you might throw 200,000 men on our shores, either as one army or by army corps, at spots sufficiently contiguous to be able to give immediate support to each other as one army, covered of course by an inshore squadron, or squadrons carrying heavy and long-range guns, and provided the weather was moderately fair. But the conditions necessary to such invasion would render invasion an absurdity. Why should an enemy invade England? The conditions necessary would be similar to those that occurred in regard to our invasion of the Crimea, viz., that our enemy must have as complete a command of the British Channel as England and France had of the Black Sea when they landed at Old Fort. And what would that imply? It would imply that our Navy was utterly shattered, that our commerce had been destroyed, that our food routes were cut. It being so, why should any country invade us? In these democratic days, with semi-starvation you would have a Commune in London and revolution throughout the country. Your army of defence would be threatened by the enemy in its front and rebellion in its rear. Our country bankrupt, our population starving, we should be at the mercy of our foes. Why, then, should they waste men and money on

invasion? If we are starved we must go down upon our knees, and no doubt our enemy would be able to demand any terms that he thought proper, including the giving up of the remainder of our fleet and an enormous indemnity, with Dover and the Thames and Medway as a material guarantee, and if the Channel Tunnel be completed, then with a perfect communication with the Continent. But as regards the gallant Admiral's able lecture, I must make this strong observation in opposition to what he has said. The Navy must be thoroughly and efficiently coal-fed from shore-protected depôts in every part of the world, giving our ships thorough freedom of action; our military ports and large commercial ports must have permanent and good defence. With regard to ingress and egress from those ports, I admit that that must be entirely dependent upon the Navy. We should have battle-ships equal to any combination that is likely ever to occur, and cruisers, not according to the number of cruisers that other nations have, but cruisers in proportion to the vast quantity of merchant shipping, on the defence of which our very existence as a nation depends. Then, gentlemen, though a soldier, I say leave the Army for the present as it is, and use your energy to make our Navy as strong and efficient as possible.

Lieutenant-General Sir JOHN STOKES: It is a great presumption on my part to rise to address this audience, but there is one point which I do not think has been quite brought out. I think we are all agreed that the Navy ought to be our first line, and as strong as it can be made, and that in order to bring it up to that point it will require a great many years' work. Admiral Colomb in his paper deprecates spending money on fortifications which might be better employed in increasing the strength of your Navy. But those fortifications which are asked for, for the defence of our coaling stations and our commercial ports, would not involve a very great expenditure, even if spread over a comparatively short time. Many years must elapse, as I say, before our Navy can be placed in the state which it should occupy in order to maintain the command of the sea, and until that object be attained you want your fortifications in order to defend your depôts on shore, and, therefore, as an interim measure, I say let us have the fortifications. In this discussion, comparing present times with past times, I think it may have been said before, and better perhaps than I can say it, that in former wars our fleets and cruisers were self-contained. They could go to sea and remain months at sea, and could hold their own until they were absolutely driven back by being dismasted by storms or during action. In these days you cannot keep the sea; you must go back for coal, and you must go back to refit. I think that point, combined with the other, shows that we ought to have protected stations, in which our ships can find what they want.

Sir LINTON SIMMONS: I omitted one point of very great importance, and, therefore, with your permission, will add a few words to what I have said. In 1803, at the conclusion of the Peace of Amiens, our total naval and military expenditure was 23,590,757*l.* In 1814, as the result of the war, our naval and military expenditure got up to 71,686,707*l.*, and we paid loans or subsidies to foreign States to the extent of 8,442,578*l.*, making a total of 80 millions for the war expenditure for the year, being the expense we had to submit to in order to maintain our position. Last year our total military and naval expenditure was 30,785,687*l.*, being an increase of only 30½ per cent. upon what it was in 1803, while the population had increased from about 16 millions to 37 millions, or 131 per cent. The charge per head of the population for warlike expenditure in 1803 was 29*s.* 5½*d.*, as compared with 16*s.* 7½*d.* in 1888, or 44 per cent. less, so that we are very much less taxed now for military and warlike purposes than we were in the early part of the century. The imports and exports in 1803 were 62½ millions, and in 1888 the imports and exports amounted probably to not less than 850 millions, carried in ships, the value of which was close upon 150 millions, representing, therefore, 1,000 millions as the value of British property traversing the sea annually at the present time, of which an average of about 150 millions is afloat every day in the year, being the value of British property upon which an enemy would have to commence operations. These amounts do not include coasting trade. If a penny on the pound were levied on the 1,000 millions of British property traversing the sea annually, it would amount to 4 millions of pounds. Sixpence on the pound would go a long way to give the country all that is required, or a penny on the pound for six years; and it

is worthy of consideration whether, as long as our policy is of a peaceful nature, any Power would seek a quarrel with us if we are true to ourselves and are so prepared during peace as to give us under Providence a reasonable certainty of success. The fact should be well pondered by every Englishman that the warlike expenditure in 1814 was about 4*l.* per head, and that by raising it to 1*l.* a head for a few years during peace it is not improbable that we might escape war altogether and continue in peace, without the prospect of having an overwhelming war expenditure forced upon us.

General Sir R. HUME: At this stage of the discussion there is very little left for any of us to say that has not been said already, either in favour of or in opposition to the lecturer's opinions, but I think, at the same time, for one or two minutes we are justified in getting up to express our concurrence or disagreement with the views that the lecturer has so ably laid before us. If I had spoken earlier I had many very brilliant ideas which I should have laid before the meeting, but so many other Officers have anticipated me that I should not be justified in taking up your time in repeating those ideas. I would merely remark that almost the first point of Admiral Colomb's lecture is the dispersal of the Army all over the world, and he goes on to say, "I will endeavour to show cause against this." As long as our Empire is constituted as it is at present, and I hope it always will be, with large detached foreign possessions and Colonies, it is impossible that we can maintain the Empire unless our Army is largely dispersed all over the world, and I myself cannot conceive a Navy so strong or so ubiquitous as to enable us to dispense with some defences for our garrisons and for the inhabitants of those places that we occupy on the sea coast at a distance from England. On that account I would say that, granted of course the first broad contention that we must have command of the sea, I think that the Navy will be supported and assisted in maintaining that command by the local defence of the positions which we must occupy all over the world. The lecturer, in what has been to me a most interesting and most important lecture, says, towards the end of it, that the moving navy must be either in command of the sea or fighting for it. When the moving navy is entirely in command of the sea, our land fortifications and defences are of relatively minor value to what they will be when the Navy is fighting for it, but when our Navy is fighting for the command of the sea, I maintain that our land defences will be of very great importance. I simply stood up, Sir, to occupy a few minutes in saying that I concur entirely with the lecturer where he says that we must have the command of the sea, but I do not agree in many points, which I have not time to allude to, in the manner in which he considers our naval supremacy should be maintained.

Admiral Sir ERASMUS OMMANNEY, F.R.S.: The observation I wish to make is this, that, assuming I had command of the Channel Fleet in war-time, nothing would make me feel more happy than to know that the approaches to our naval ports and arsenals were defended impregnably, so that I could have free action to operate against the enemy in all parts of the Channel. With regard to the history quoted by the lecturer, I differ with him very much, because I think, so far as history goes, it shows that fleets have seldom succeeded in attacking fortresses. With regard to the advantage of fortifications, I would quote Malta, for instance. Defended as it was in former days, no ship could enter Valetta harbour exposed to the raking fire of Fort St. Angelo and the cross-fire from other batteries without being sunk; therefore, this important island succumbed only after blockading. Much stress is laid on the relief of Gibraltar by the fleet of Lord Howe during the celebrated siege by the combined forces of France and Spain, but previous to the appearance of this fleet, the garrison of Gibraltar had nobly repulsed the formidable attack of our enemies on the Rock by land and sea. This impregnable fortress has proved a tower of strength to us as a naval depôt and a base of protection to our commerce with the Mediterranean and Morocco. I, therefore, think that our ports should be sufficiently fortified. I wish to point out that Admiral Colomb has made one oversight with regard to the operations of the French Fleet during the Franco-German War. The reason why the French Fleet remained inactive was owing to the seamen being sent to Paris, where they were employed in manning the detached forts when Paris was invested by the German Army. I merely point that out and will say no more at present, unless we should have to go over the ground

again. I think we are extremely obliged to Sir Lintorn Simmons for bringing forward that Report on the recent naval manœuvres so conspicuously before this meeting, and I think every naval Officer must endorse the opinion expressed by that Committee. I was very glad to hear Sir John Colomb point out the importance of the Island of Mauritius. I know it well, it is the Gibraltar of the Indian Ocean. I would emphasize as strongly as Admiral Colomb the importance of maintaining our supremacy at sea. I say, let us have two strings to our bow, let us have the forts as well as a formidable Navy, and when the emergency arises I hope that the Army and Navy will have "a pull, a strong pull, and a pull all together."

Lieutenant-Colonel FEATHERSTONHAUGH, R.E.: Captain Penrose Fitzgerald challenged the Army to answer this question. He said the "Times" had remarked that if the Navy is as it ought to be, no more is required. Well, Sir, I would just allude to what occurred at Berehaven. There we had one Admiral blockading another Admiral, and we must suppose the first Admiral was in command of the sea. What happened? The Admiral blockaded broke out. The place I was at was about thirty-six hours' steaming from Berehaven, and as soon as we heard he had broken out we calculated he might be with us at five o'clock on a certain morning. He arrived at seven o'clock, and if he had been a fast going mail steamer crossing the Atlantic he could not have performed a more rapid or more perfect voyage. These ships, Sir, that broke the blockade touched at every commercial port in the kingdom—Liverpool, Aberdeen, Leith, the Tyne, the Tees, and I do not know where else they did not go, and there was not anybody able to stop them. I mentioned that to a distinguished Officer the other day, and what did he say to me? He said, "We do not intend to defend the commercial ports." There is another cat has jumped out of the bag. The Navy may win a victory off the Downs, but in the meantime every port in the kingdom is to be smashed to pieces. Is this meeting to approve of that idea, and would the country like such a state of things?

Captain FITZGERALD: May I be allowed to repeat a short quotation I made at the last meeting, as there seems to be some misunderstanding about it: "If the Navy is made thoroughly competent for its work no other defence for these islands, or for the Empire at large, will ever be called into play: if the Navy fails us no other defence will avail to avert crushing disaster."

General HARDING STEWARD: It is now so late that I will not detain the meeting more than two minutes. I wish to speak about commercial harbours. But, before saying anything on that subject, I must say that I admire the way in which Admiral Colomb has attacked us Engineers. He has, I believe, done it with an object, and I think he has gained that object entirely: although he has *not* proved his case. I think, however, that he cares but little about that. During his lecture, about the end, I observed that he made one important admission. For, after decrying fortifications and saying they were *not necessary*, he admitted that the coaling stations ought to be secured by fixed defences from capture by a *coup de main*. That is, however, all that we Engineers want to do. He then went on to speak of commercial harbours and to say that they need not be defended by fixed defences. (Admiral Colomb here dissented by gesture.) The Admiral has unquestionably derided the use of fortifications for the greater ports, and I am sure that he altogether yielded their use for the smaller ports. At least I understood him so. But, whatever may be the drift of this lecture, I want to point out that Admiral Colomb has, on a previous occasion, written some very admirable notes and memoranda on the attack by cruisers of these same commercial ports, and he has proved to us that some local defences must be provided for them. We must, in fact, have what has been very properly called "the minimum of defence" both fixed and floating for these ports, and that, I think, is all that the War Office *desires* and, at any rate, all that the War Office *can* get from the country. Unless we have a small amount of fixed defences at our commercial harbours we may have our commercial fleets burnt at their anchorages. I really trust that what the gallant Admiral has said against fixed defences may not go the round of the Press, nor cause the public to object to, and the influential people in the commercial ports to come forward and decry the use of the moderate amount of fixed defences which we Engineers now desire to see provided for those ports.

Admiral BOYS : We have listened to one of the most important lectures and one of the longest discussions that I recollect in this theatre. My remarks will be very short. Admiral Colomb prefaced his paper by asking members to "give it him hot," and I think to a certain extent he has had it pretty hot from some of the speakers. He refers to history to prove his case, but I think history is not altogether on his side. If instead of going back 300 years he had gone back as long as history records, he would find that there actually had been invasions and descents on the United Kingdom to the number of seventy, and forty-two since the commencement of the tenth century. It is our duty to prevent the possibility of number forty-three. We have had a good many opinions here from naval Officers on this side of the Channel on this matter of blockading the enemy's fleet; I think naval Officers on the other side of the Channel have also an opinion, and I heard it stated lately that when the subject of our blockading their fleets in their harbours with our fleet, as it now exists, was mentioned, it was received with a doubtful smile. They think and they venture to state that with a very little help it is not impossible that they might be able to drive our ships into our harbours and blockade them there. That is not a position to be contemplated with any satisfaction. I must say I agree with Admiral Colomb, as many others do, in his endeavours and his advocacy to increase the fleet, and in such numbers as are considered requisite for the duties which it ought to do; but if he proposes to leave our commercial harbours and our arsenals and our ports generally without any land defence whatever, I cannot agree with him.

Mr. R. N. PENROSE FITZGERALD, M.P. : Would Sir Lintorn Simmons, who has given us the most vital important statistics I have ever heard on this question, kindly, if possible, add to them the statistics of the value of the food supply imported by sea into this country in 1803, and the value of the food supply that is imported into this country in 1888 or 1889? I ask it purely for use possibly in another place, as it would be most valuable information.

Professor LAUGHTON : At this late hour I shall limit myself to very few remarks. I had meant to touch on the general subject of the lecture, but my opinion having been so fully expressed, more especially by Sir John Colomb, that there is scarcely room for me to say anything more, but on some of the historical allusions made by the lecturer and other gentlemen, a few words from me will, perhaps, not be altogether out of place. Admiral Boys said that this country has been invaded forty-two times; and Sir John Hay pointed out that in past times the country was successfully invaded by William the Conqueror, by William III, and by Henry Tudor. This last can scarcely be counted as an invasion; but in any case, there was no fleet to oppose it; so also with regard to the instances referred to by Admiral Boys. But as to William the Conqueror's invasion, Sir John Hay has overlooked the fact it was delayed in Normandy for three months after the army was ready; it was waiting—we are told—for a south-west wind; a south-west wind in the Channel in July, August, and September! The statement is absurd. It was waiting because the English had a powerful fleet at the Isle of Wight; and until that fleet was broken up, the Duke of Normandy could not risk the passage; when the fleet was no longer there, he crossed and effected the conquest. William III's landing can scarcely be spoken of as a foreign invasion: his fleet was commanded by an English Admiral, Herbert; and the English fleet which was assembled at the Gunfleet to oppose him had been won over to his cause. No opposition was offered by it, and the Prince of Orange had reason to believe that none would be offered. I think Admiral Colomb's argument is a very strong one; that with the Navy in command of the sea an enemy cannot undertake the operation of an invasion. It seemed to me in the course of the discussion that many of the speakers have not realized the power of a fleet in a flanking position, threatening to act on the rear, or to interrupt the operation of landing, on which Admiral Colomb has laid such stress. It is, as Admiral Colomb has pointed out, a matter of historical fact, a matter of common experience extending through all ages—not a matter of the last fifty years, but from the beginning of history—that no commander, if he is wise, will undertake a territorial attack as long as his operations may be interrupted by a fleet even considerably weaker than his own. Admiral Colomb mentioned two distinct cases in which a commander had violated this principle.

He might have gone further, there have been others. There was one as far back as 1217, when the French fleet, in great force, bringing reinforcements to the Dauphin in England, ignored a comparatively small force at Dover. What was the result? This small force fell on the rear of the French fleet, and annihilated it, off Sandwich, simply because it caught the French fleet in the most unfavourable position in which a fleet can be taken. Another instance occurred in 1759. The lapse of more than 500 years, and the enormous changes in the details of naval war, had made no difference in this fundamental principle of naval strategy. M. de Conflans, sailing from Brest, attempted to conduct the operation of taking on board an army, and that while such an enemy as Hawke was free to act on his rear. Hawke made a hawk-like swoop, and demolished him. These are two instances. I am not sure that the Battle of the Nile was not another. At any rate it is certain if by possibility Nelson had had with him the frigates that he ought to have had, if he had had one ounce less energy than he actually did have, the French fleet would have been caught in the ideal position that Admiral Colomb has pointed out, and have been made an example of to all ages. It was pretty well so as it was, but it might have been much more.

Captain FITZGERALD: Is not that an example of territorial attack when the attacking fleet had not command of the sea?

Professor LAUGHTON: The French fleet was destroyed.

Captain FITZGERALD: They conquered Egypt.

Professor LAUGHTON: The fleet was destroyed, the communications were cut, and the army was left in a mess from which not even the genius of Bonaparte could extricate it. There is just one more word I have to say. A good deal has been said about Gibraltar. It has been pointed out that the fortifications rendered its defence possible in the war of American Independence; that without the fortifications it could not have been held. It seems to me that it would have been a good thing for us if there had been no fortifications, if the enemy had been free to come and go. What possible good was Gibraltar to us for the four years the Spaniards were besieging it, from 1779 to 1783? Some 6,000 or 7,000 soldiers were shut up there, and the fleet was obliged at all risks to relieve them. What was the use of it? It was defending nothing; no property, no route; we had no interests in the Mediterranean, absolutely none, but because the strong fortress was there, and it would be dangerous in the hands of an enemy, we were obliged to retain it. For that we sacrificed our American Colonies. In 1781, when Darby was fitting out a large fleet to relieve Gibraltar, the blockade of which was maintained by the Spanish fleet, De Grasse was at Brest fitting out a powerful fleet for the West Indies. Darby would not interfere with De Grasse, for fear that if he made any attempt to do so, De Grasse would go south and join Cordora, and the two fleets, the French and Spanish combined, might prevent the relief of Gibraltar. He, therefore, drew back and waited at Cork till he understood De Grasse had sailed for the West Indies, and thence to the coast of North America. The action with Graves off the Chesapeake, the surrender of Cornwallis, and the loss of the American Colonies were the direct results.

Admiral COLOMB, in reply, said: Some of the speakers have pointed out that possibly my chief object in reading a paper, which certainly seems to have presented numerous anomalies to the audience, was raising a discussion. Now, with the help of our gallant Chairman, whose name was sufficient to bring the large audience together, we have had, I think, one of the very best discussions on any paper which has been read in this theatre. For my own part, the only fault I have to find with the discussion is that I have not been hit hard enough—perhaps I should not say hard enough, but close enough. That my friendly adversaries have not got out their daggers and their fists and come at me, but they have stood far away with their long lances, or with weapons of still greater range. What I mean is, we have been discussing a purely scientific paper, with the title "The Relations between Local Fortifications and a Moving Navy," and yet I am satisfied that when we come to read the discussion side by side with the paper hereafter, we shall see that we have said very very little indeed concerning those "relations." I must instance in saying that, and I do it of course with great diffidence, what Lord Carnarvon said, as showing that truly the points of the paper have seldom been grasped by the audience.

It has happened to me before this to read a paper here, to have it warmly denounced by a brother Officer, and to find that Officer saying to me after some little time, when I had asked him to re-read the paper, that he had re-read it, not once but twice, and that a veil had been removed from his mind, and that he saw the position I had put before him in an altogether new light. Now, when you have to put a great deal into an hour's paper, your words have to be so very accurate that they will not bear paraphrase. The moment you come to paraphrase you are nearly sure to go wrong. Most of the speakers have mentally paraphrased a great many of my sentences and misapprehended them. But, coming back to what I said about the instance of Lord Carnarvon showing how the real points of the paper have not been grasped, we must remind ourselves that Lord Carnarvon probably has thought of those things more than any of us here present. As the Chairman of the Royal Commission, he must have had the whole subject very much before him. What is the gist of my paper? I took as my texts certain theses which were put forward by a previous lecturer. What Lord Carnarvon has done, if you come to read his speech carefully you will see, is to reassert all those theses which I was discussing, but without considering it necessary to support his re-assertion by correcting a single one of my historical references or a single one of my illustrations. He said, towards the close of his speech, that the object of fortifications was first to free the Navy; *secondly*, to preserve ships so as to enable them to be repaired; *thirdly*, to supply coal to the ships; and *fourthly*, to deter the enemy's cruisers. Now these are exactly the four points that Captain Stone put forward, and those are exactly the four points that I used, historical and hypothetical illustrations, to combat, in order that we here, a naval and military audience, might get to the bottom of them and see whether it was actually so. Sir Lothian Nicholson flattered me in the strongest way when he said that this paper that I wrote would have a great influence on public opinion. Well, I do not deny that it may have a great influence on public opinion, but what Sir Lothian Nicholson said was that what would give it that influence would be the fact that it was read by an Officer like myself. Now I am quite certain of this, that any little influence I might have does not come in any way from me personally, it comes simply from the facts that I collect and put forward; and if it be the case that this paper is to have an effect upon public opinion, it will have it because I have endeavoured, even as an advocate, to put forward the truth. It is perfectly true that for the purpose of discussion I have put what appears to me to be the logical truth very distinctly, and as closely as I can, and also in such a way as to excite the opposition which I am happy to say has been excited. But I am sure of this, that the real discussion on this paper will take place hereafter. We have only started it now. We have to recollect this. And here again I must refer to what Sir Lothian Nicholson said. He pointed out that it would be an evil if my paper appeared in the press in anything like a complete state, and that the discussion in opposition to it, which he rightly judged would be in opposition to it, should appear in a garbled state. But all that has been said in opposition to me has been said year after year and month after month for 23, 24, or 25 years steadily. It is the first time, as far as I know, that the general view of the relative functions of fortifications and the Navy has ever been challenged. Why did it become to me so important to challenge it when I heard the opposite view distinctly stated by Captain Stone in this Institution? It is because, unless the Army and Navy come together in this way and discuss these points, where our functions are likely to overlap, and arrive at something like conclusions about them, we are doing what Sir Lintorn Simmons said we were doing, what I myself feel we are doing very often, that is, having a sort of game of pulley-hauley with the Chancellor of the Exchequer. But I am so satisfied with the cordial relations between the two Services as to believe that we want nothing to bring us together and to make us see our parts perfectly clearly but the continuation of the sort of discussion we have had here. Every one of us, I should think, must have had some new thoughts, some new suggestions, as to how far the Navy goes in these matters, and how far the Army goes; and what would happen to the Army if the fortification bills went up and the moving navy bills went down, and *vice versa*. If the Army were relieved from the pressure which now lies upon it—and it is a great pressure that providing heavy garrisons for heavy works—how could it be advan-

taged? If it were ascertained that the Navy could do the things which Colonel Maurice told us of, and that naval people all knew it? Colonel Maurice told us, and this is another reason why my paper was read—what is absolutely the fact, that the Navy steadily repudiates, and has for years repudiated, this defence question, and it has distinctly said: "We will not have anything to do with places like Singapore, or Aden, or Colombo, or the Cape: we will wash our hands clear of it. It is your business in the Army to do all this, our business is elsewhere." Now that point in the naval mind is one of my principal objects of attack. I do not think that it is true: I do not think it possible that the Navy, whatever it may have done in former days, can shake from its shoulders this question of the defence of the ports. My gallant friend Colonel Steward, speaking of the commercial ports, said that I thought they could not be defended by fortifications, but I have never said that, and have never thought that of the ports themselves, only of the shipping frequenting the ports. If you examine my paper you will see that all through it I admit the plain patent fact that any port which you can close, any port that you do not care about keeping your communications open with, can be made secure with fortifications; and you can make it so secure that, like the hall-door of your house, it is the very last place that the burglar will think of going to. But the whole point of my paper is the difference between a port which you can close and a port which you must keep open. The point of it is that with regard to the coaling stations, these ports are, every one of them (I may except, perhaps, Bermuda), ports that the Navy must in some way keep open, because from them and to them flows the life-blood of the Empire. It has been constantly said by many speakers that I recommend the leaving of the ports defenceless: the idea of leaving the ports defenceless never crossed my mind. But I say that ports are defended—and that history shows it distinctly down to the other day—from heavy attacks by the threat of these attacks being interrupted from the sea, as was so excellently put by Professor Laughton; that the entry and exit to them must be protected by a naval force, a floating force, a moving force, and cannot be protected by anything that is fixed. As it is necessary for you to provide this moving force, it then becomes a question whether behind that moving force it is necessary to go to any very great expense in the matter of fixed fortifications, submarine mines, and what not. The mistaken point that most of the speakers have had in their minds is that where there were no fortifications there was nothing. But that has not been in my mind, and that has never been in my brother's mind, who, as far as I know, was the earliest of all to raise the question of the defence of the coaling stations. If you will read his first pamphlet on the "Defence of our Commerce," published, I think, in 1867, you will note that he was always thinking of open ports kept open by naval force, and that he never had the slightest notion of heavy fortifications. He wanted a good garrison; he wanted special port defence vessels, and there in his diagram you have these port defence vessels, not defending the place itself, but the surroundings of the place, keeping the communications with it open, guarding the commerce where it was concentrated from the attacks which were most likely to be made upon it. And so you must recollect that when speaking of fortifications not being effective, I mean they are not effective for a port which must be kept open, because they will not keep a port open. I am sure that every military man will agree with me there; fortifications alone will not keep a port open. If you can afford to allow a port to be closed, all right, go on, spend what you like; but if it is a port you must keep open, we ought to go to work to keep that port open to provide the necessary force for keeping it open, and I think it stands to reason that if we keep the port open, we defend it. I cannot see that there is anything on the other side. If you provide a naval force sufficient to keep the port open, the enemy cannot touch that port. I am giving, of course, but a general reply. The time has gone on so long that I am sure those speakers who would like to be answered separately will excuse me from going closely into what they have said, and I think there is the less reason for me to do that because the paper will be found, if you study it closely (for I do myself the credit of saying that it is most carefully written), and go into it side by side with the criticisms that have been offered, there will be a great deal more agreement with me than there appears to be at the present moment. At the same time, I must admit, as I admitted at the

beginning, that for the purpose of raising discussion I have pushed the theoretical scientific question, I think, perhaps as far as I can push it. The practical outcome of it is a matter that I have not touched upon in the paper, but that is chiefly what has been discussed in this theatre, mistaking, I think, the tendency of the paper. I regret, of course, that the scientific question has not been more thoroughly discussed than it has been, but I feel sure that the discussion will go on in our minds, and that we shall come to some definite conclusions about it. You must recollect that such a paper as this has been in my mind ever since the Estimates were moved for last year, when there was a vote on a loan of 3,000,000*l.* for fortifications side by side with a reduction in the Naval Estimates of 900,000*l.* That, I may say, was the moving spirit behind me, and I do believe that if this audience were called upon to pronounce upon a similar proposal now, it would not be carried. There is just one question which I might mention. It was put forward by Sir John Stokes, the very old argument that as the Navy was weak, and as the Navy could not at the present moment have the command of the sea which we desire for it, we had better go and spend the money on fortifications on that understanding. The chief reason adduced why we should take that course appeared to be the question of time. It is held that we could provide fortifications more quickly than we could the necessary naval force. I altogether differ from that. My impression is, if it is a question of time for the defence of the coaling stations, we can more readily get merchant ships fitted up with whatever guns can be had, than we can mount the same guns on land. And these guns, so mounted, are not only competent to protect the port, but to protect the shipping which make the port. That is the argument. I do not mean to say how that is. I must thank you, Sir, very heartily, for taking the chair during the discussion of a naval subject of this kind. I give myself credit for policy in asking you, Sir Frederick Stephenson, to take the chair. I felt this, that if you took the chair and read my paper before taking it, which you did, it would be certain that I should say nothing in that paper which would be hurtful to the feelings of the sister Service. I knew very well that if you were in the chair we should not get hotter than we need get, and I felt that your presence in the chair would bring together a large military audience, and would give a guarantee that I was not, as some speakers do really seem to think, putting the Navy against the Army, which is the very last thought in my mind. What I have said in the paper, and what I must repeat now, is, that I am afraid that if the Navy and the Army do not join together in these discussions and come to definite conclusions as to their relative positions under the changed circumstances of warfare, a great deal of money will be spent, and, as the public say, they will get nothing for it. But if the Navy and the Army can thus settle what their functions are to be, even the Ministry of Defence, which Sir Lintorn Simmons is so anxious to have, would become not a necessity, for we should have settled all the points which the Minister of Defence could settle, before he was appointed to his post.

The CHAIRMAN: Gentlemen, at this late hour of the evening I shall confine myself to very few remarks indeed. In the first place, I think the gallant Admiral may be satisfied on one important point, and that is the vital importance which we all of us attach to the supremacy and the most thorough and complete efficiency of the Navy. I think that is a point upon which we all agree, and I need hardly satisfy his mind upon that point. I only wish that one half this feeling were prevalent throughout the country at large, which is awaking at last, we must all be glad to see, from the indifference, not to say the apathy, with which it has viewed the important and vital question of the national defences of the country. There is one other point upon which I hope the gallant Admiral may also be satisfied, and that is that the requirements of the Army for carrying out these national defences are not likely, I should hope, to interfere with the claims which the Navy may make upon the public purse. The Navy, of course, are entitled, and I hope they will get it, to the first and the fullest consideration; but there are also some points upon which I think also the Army may have some slight claim as well. Gentlemen, with regard to the reply the gallant Admiral has made, I think it may possibly qualify to a certain extent the impressions that existed in the minds of those who spoke with regard to the subject of his lecture, for he now tells us that he is perfectly alive to the necessity of a certain amount of defence to our ports, our arsenals, and our

coaling stations. Now that, I confess, I understood was the very bone of contention, it is the very subject I understood of his lecture; however, I am very glad to find by this expression of his opinion now in his reply that we are all at one upon this. It is unnecessary almost to dilate upon the absolute importance of the defence of our arsenals, our ports, our coaling stations, and, I should like also to add, of the principal of our commercial ports, certainly towards their sea fronts. With regard to the coaling stations, by putting them in a proper state of defence, we surely keep the Navy from the necessity of protecting them to a very considerable extent, and we give the Navy thereby a freer hand to act upon our lines of communication, instead of detaching certain vessels to hang about these coaling stations, which for the time being are perfectly capable, or should be made perfectly capable, of defending themselves. I think, however, in this respect there will be no wish to make any claim upon those funds, which, I hope, will be almost, if not entirely, devoted to the efficiency of the Navy. I have only one thing more to do, and that is to ask you to allow me to convey to the gallant Admiral our very sincere thanks for the able manner in which he has drawn up his paper. I think we are excessively indebted to him for it. I think also we are still further indebted to him for this, that in bringing forward his paper, he has done so in the most disinterested and broad-minded spirit. He has wished under no circumstances to cram his views down our throats; on the contrary, his object has been to elicit and draw forth the freest possible discussion upon all points, and I think, considering the very full attendance which he has had at his lecture, and at this adjourned discussion, he may be fully satisfied that his wish has been thoroughly carried out.

Friday, February 22, 1889.

ADMIRAL THE RIGHT HONOURABLE THE EARL OF CLANWILLIAM,
K.C.B., K.C.M.G., Member of Council, in the Chair.

OUR NAVAL POSITION AND POLICY.

By the Right Honourable LORD BRASSEY, K.C.B., &c., &c.

HAVING dealt with the amount of building required in the Navy, in an address recently delivered at the Mansion House, I propose to-day to treat of our shipbuilding with reference to types, and to close with some remarks bearing on the efficiency of our Dockyard administration. I am fully sensible that the undertaking is hazardous. I am encouraged to persevere by the controversies of the experts. It may be that a mere layman, after calmly hearing both sides, may reach conclusions not unworthy the consideration of those who, if they know more, are perhaps less able to be impartial.

I commence my task with a brief review of recent shipbuilding abroad and at home. Having traced the direction which contrivance and invention have lately taken, we may perhaps find some indications to guide us in our programme of shipbuilding for the near future.

First, let us review the ships building abroad. In the class of battle-ships, France has adhered chiefly to a type much admired in our own Navy. The French ships are defended by a continuous belt, and they have the advantage of a high freeboard. In our ships the heavy guns are better protected, and recently we have established a decided superiority in speed. The Italian constructors, while building vessels of the largest dimensions as yet accepted, have thrown off belts, preferring other methods of protection for the vitals of ships. In armaments, and in armour for the protection of guns, in speed, and coal endurance, their ships are matchless. The Germans are imitators rather than pioneers in matters of construction. The United States, after a long pause, are adding to their Fleet several ships, in which are combined the best features of recent construction elsewhere. The Russians are throwing their main efforts into turret-ships heavily armoured and armed.

Neither abroad nor at home are the constructors allowed to pursue their way unchallenged by criticism. In England, among ships of recent construction, the "Admiral" class and the belted cruisers are the types which have been most criticized. These classes are so numerous represented in the Navy that it would be little short of a national disaster if we were driven to regard them as absolute failures.

Of the "Admiral" class we have built six, and they have cost nearly four and a half millions sterling. Sir Edward Reed would remove the "Admirals" from our list of battle-ships on the ground of deficiency of protection at the water-line. Admiral Hood and Mr. White, in their evidence before the Select Committee on our Navy Estimates, refused to concur in this condemnation. Referring to the risks of the loss of stability by the penetration of the unarmoured sides near the water-line, Mr. White told the Committee that the "Admiral" class would fight with risks of the same kind as the ships with narrow belts of foreign navies. His views were confirmed by Admiral Hood, who said that, for the fighting purposes of a ship, under the usual conditions as he found them at sea, his experience led him to the opinion that it was not of vital importance whether the upper edge of the belt was flush with the water or 18 inches above the water-line. Whilst expressing a favourable opinion generally of the "Admiral" class, Admiral Hood had considered it desirable to give more protection to the "Nile" and "Trafalgar" class, for the designs of which he was personally responsible. In these two ships the 20-inch steel-faced armour is reinforced by inner armour with a strong system of girder work. The armour is not only thicker, but it extends over an area of side considerably larger than in the case of the "Admiral" class. It is important to take note of the sacrifices required to secure this increased amount of armour. The tonnage has been raised from 10,600 to 12,000 tons, and the cost from 729,000*l.* for each ship to 854,000*l.* An addition of 1,400 tons to the displacement, and an increased expenditure of 124,000*l.*, is the price which it has been necessary to pay for the additional defensive power of the "Nile" class. There has been no development of offensive power in the later ships. In point of speed and coal endurance, the "Nile" and "Trafalgar" are somewhat inferior to the "Admiral" class, although their armament is approximately the same.

A general summary of the fighting efficiency of the "Admiral" class was given by Mr. White, in answer to a question put by Mr. Maclean, a member of the House of Commons Committee. Mr. White pointed out that the "Admiral" class had an armament of unrivalled power. The disposition of the armament was, by the common consent of naval authorities at home and abroad, the best afloat. The guns were carried high above the water; the auxiliary armament was very powerful. The claim put forward for the "Admiral" class, that they should be rated as battle-ships, was not, in Mr. White's view, to be disallowed because their belts were narrow and did not go to the ends. His definition of a battle-ship was a vessel which, carrying heavy guns, has its auxiliary guns mounted in armoured stations and has the vitals efficiently protected. He considered that the Italian ships, the "Sardegna," the "Umberto," and the "Sicilia," were battle-ships of the first rank. They had no side-armour, but they had strongly curved decks and a magnificent armament, all the heavy guns and the hydraulic and other mechanism necessary to the working being protected by thick armour.

It will be admitted that the "Admiral" class would be more

satisfactory if they had more protection by armour. Keeping within the limits accepted as to size and cost, and having a fixed amount of weight available for armour, it might have been preferable to take something from the armour on the barbettes, in order to give more protection to the battery. It is questionable whether it would have been expedient to give an additional proportion of weight to the protection of the water-line.

Let us pass on to the belted cruisers. Seven vessels of this type have been built at an expenditure of three and a half millions. The position of the belt has been made the ground of a severe condemnation of these vessels. The Admiralty witnesses were closely questioned by the Committee on the Navy Estimates as to the efficiency of the belted cruisers. Neither Sir Anthony Hoskins nor Admiral Hood nor Mr. White concurred with the critics in attaching a vital importance to the position of the protective belt. Sir Anthony Hoskins gave his views in the form of an argument. He did not think it wrong to send the ships to sea, though he would have wished that the mistake in the calculations for the construction of the ships had not been made; but, while making this admission, he urged that the armour belt was placed on the ship's sides for the protection of the vitals. As the ship goes down in the water, the vitals are submerged and thereby protected: as the ship lightens, and the vitals become exposed to shot, the belt also rises and gives protection. It is undesirable that a ship should have a greater draught than she is designed for, but in the case of the belted cruisers the vitals are equally protected, whether the armour be above or below the water-line.

In the important element of speed the belted cruisers have more than fulfilled the conditions laid down for the original design. Outside Plymouth breakwater, the force of the wind being 8, the "Orlando" steamed 13.8 with one-third power, 16 knots with two-thirds power, and 17.141 with forced draught. In the smooth water off the Maplin Sands the "Immortalité" did 19½ knots with forced draught. The gunnery trials have been satisfactory. Belonging to the class of protected rather than armoured vessels, the belted cruisers do not seem to merit the condemnation which has been passed upon them for deficiency of armour. It is perhaps the greatest defect of this class that, as at present armed, they require a complement of more than 500 men. In war it would not be desirable to place such large numbers in a mere protected cruiser. All our cruisers, as Admiral Baird pointed out to the Committee on the Naval Manœuvres, are overloaded with armament. Mere weight of armament will not make an unarmoured ship a battle-ship; and if regarded, as they should be, as cruisers, our belted vessels are far more heavily armed than French cruisers of corresponding tonnage. The "Cécille," of 5,766 tons, carries no gun heavier than the 5-ton gun. In the case of the "Pie Monte," recently purchased by Italy from the Armstrong firm, the armament was changed from heavy pivot guns to four 111-pounders, quick-firing guns, mounted on sponsons, two on the bow and two on the quarter. If the armaments were reduced the complements could be reduced. The comfort of the crews of Her Majesty's ships is not

undeserving of consideration. Manned as at present, the belted cruisers are overcrowded, and the discomfort caused by the want of space is aggravated by insufficient ventilation. This should be, and can be, remedied. Defective ventilation is a frequent and a grave fault in our ships-of-war. It makes the heat below intolerable. The falling off at sea from the speed at the measured mile is largely due to the closing up of openings while completing ships for commission.

Of the vessels which have commanded general approval, it is not necessary to say much. The "Victoria" and the "Sans Pareil" are the most powerful single-turret ships which have yet been built. They carry a pair of 110-ton guns in a single turret. The bow fire will be of crushing power. The auxiliary armament is very formidable; but the guns are fought behind easily penetrable armour. If shells are employed with high explosives, a corresponding defence by armour will be required for all the fighting positions in the ship.

In reviewing our most recent proceedings in relation to ship-building, the decision taken by the Admiralty, as reported in the public prints, in relation to the refit of the "Minotaur," seems open to criticism. For war, the value of these ships depends mainly on their speed and coal endurance. In this regard they can never be satisfactory so long as their old-fashioned engines and boilers are retained. An expenditure of 50,000*l.* is wasted on a policy of half measures. With triple expansion engines and suitable boilers, the ships would have a high speed and good coal endurance; with our old engines and old boilers they will have neither the one nor the other.

In the cruisers laid down by the present Admiralty, speeds rarely attempted before in vessels of corresponding dimensions have been reached. In the "Blake" and the "Blenheim" the dimensions have been carried to 9,000 tons. It has been found necessary to accept these unprecedented dimensions in order to secure decided superiority over the latest cruisers in construction abroad. Without entering into the details of the design, the "Blake" class may be regarded as a type of which we shall require more than two to give effective protection to our fleet along the great ocean highway to Australasia.

In the recent construction for the Navy, the building of gun-vessels of the "Pheasant" class would seem to yield the least satisfactory results. The great improvements which mark the new class of gunboats will at once be admitted. It is sufficient to walk round the steam basin at Portsmouth, and to compare one of the new class with the "Medway," to appreciate how great has been the advance in the later designs. It is, however, a question whether powerful cruisers are not more necessary than gunboats for the reinforcement of the Navy. For the police of the seas we have no lack of vessels on the Navy List. If our gunboats are worn out or obsolete, it might have been feasible to utilize the corvettes of the "Gem" class and the "C" class. With reduced armaments and reduced complements our corvettes might have taken the place of the sloops, and our sloops might have relieved the gunboats.

Passing from ships lately built or building to the programme for

the future, it should be the first object to strengthen the Fleet in the line-of-battle. In ships of the first class, offensive and defensive powers not inferior to those of the "Nile" and the "Trafalgar" will be insisted upon. The new vessels to be laid down should not be mere repetitions, but, if possible, improvements upon their predecessors. It would be a vast improvement if our battle-ships could be constructed with those lofty bows which give to ships of the "Alexandra" and "Hercules" type a conspicuous advantage over later models when steaming at speed against a heavy sea. Such an improvement might be realized in a design having a bow- and a central-battery as in the "Alexandra." The disposable weight would be represented by a turret armed and armoured as in the "Nile" and the "Trafalgar." Their great cost, falling little short of 800,000*l*, for each battle-ship of the first class, renders it impossible to multiply such vessels beyond a certain limit. It is necessary to turn to smaller types, and of these none would appear to give greater promise than the armoured ram.

Dealing with a professional topic, it will be more impressive if the views of a layman can be conveyed in language borrowed from members of the naval profession. No navy has displayed more original genius in construction than that of the United States. In the Report of the Secretary for the United States Navy of 1870, the marine ram is alluded to as "a new element which promises, when constructed upon sound principles, and in forms of special strength for its particular and appropriate service, to be a weapon of most destructive warfare." The value of rams was specially insisted upon by the Admirals who had commanded during the Civil War, and who at its close were requested to draw up reports for the guidance of the Naval Department in relation to shipbuilding. Amongst these experienced sea-officers none perhaps wrote more clearly and more forcibly than Admiral Goldborough. Arguing that no ship of rational dimensions can support throughout her exposed parts more than a very limited thickness of iron plating, and that the strongest armour can be but of poor account unless other elements of efficiency, and notably that of celerity in turning, are secured, he insists that every ironclad, as a matter of course, should be an unexceptionable ram. This she could not be unless capable of being directed with a great degree of promptness to any desired quarter. Velocity was of primary importance; it made the vessel herself a terrific projectile. "The value of rams," he said, "at this moment cannot be over-estimated. With a few in each of our prominent commercial ports no enemy could blockade them. Rams intended for purely harbour defence would be better without guns. They themselves would be the projectile, the steam the powder, and the effect of both properly combined would be absolutely irresistible. To fit the rams with guns would swell the cost largely, and so abridge the multiplication."

Turning to the French Navy, the armoured ram was strongly recommended by Admiral Gougeard, the Minister of Marine under M. Gambetta. Admiral Gougeard's design, as described in the "Engineer," was intended to be armed with the torpedo as the prin-

cipal weapon, to have great speed, and to be protected by a steel deck; the floatability being guaranteed by means of cells filled with buoyant material. The type contemplated by Admiral Gougeard is represented in the British Navy by the solitary "Polyphemus." A ship for the same purpose could be designed of a more solid and yet less costly construction. The superstructure could be simplified, the torpedo armament reduced, the thin but expensive armour of Whitworth steel plating being replaced by more solid but less costly armour.

That rams alone would not constitute a satisfactory or efficient fleet for the general duties of the Navy will be obvious. Enough, perhaps, has been said in support of a proposal that some vessels of this class should be taken in hand. In combination with our line-of-battle ships armoured rams would be of great value.

Passing to the cruisers, the "Blake" and "Blenheim" have been already mentioned. In the construction of vessels of more moderate dimensions, we have to make our choice between various designs recently produced. We have in our own "Leanders" models of symmetry with great speed. Among cruisers lately built, of comparatively small dimensions, the "Pie Monte," as described by Lord Armstrong, is a vessel which presents a remarkable combination of armament and speed on a displacement of 2,500 tons. The "Medea" and the "Medusa," now completing for our own Navy, represent a satisfactory design for a swift cruiser of moderate dimensions. Fast cruisers of this type are essential in European waters. The swift sea-keeping torpedo gunboat is a type of vessel most valuable for the purpose of blockade, and as an auxiliary to the heavier ships. We need a large reinforcement of this class.

To conclude this part of my subject—assuming our normal expenditure on shipbuilding to be on the scale proposed in the address which I had the honour of delivering before the Chamber of Commerce—that is to say, double the amount of the appropriations in the French Estimates, and assuming our expenditure at the present time to be in round figures three millions annually, equally divided between the armoured and protected classes—our programme of construction should enable us to add every year to the Fleet the following list of vessels: 1 battle-ship of the first class, 3 armoured rams, 2 "Blenheims," 3 "Medusas," and 8 "Sharpshooters." The shipbuilding policy for the British Navy must be adapted to the circumstances of the time. It will always be possible, by means of a special effort, to make additions to any particular class of ships in which it is thought that we are deficient. Supplementary Estimates on the one side must be met by Supplementary Estimates on the other.

From shipbuilding I pass, by a natural transition, to the administration of those great establishments in which our ships are built. It has been the custom to hold up the Dockyard administration to contempt. We have recently had a more favourable opinion, and from an authoritative source. The Dockyard expense and manufacturing accounts, those important combinations of figures in which the whole results of the manufacturing operations of the Dockyard are built up

into a comprehensive balance-sheet, have lately, for the first time, been submitted to the searching audit of the Comptroller-General of the Exchequer. That high authority expresses satisfaction both with the principle on which those accounts are prepared, and with their accuracy in detail. The results of a test audit lately for the first time applied by the Treasury to the Store Accounts are equally satisfactory.

As to the comparative cost of Dockyard and contract building, we have the evidence of the Director of Dockyards, who has come fresh to his post after a long and successful career in the private trade of the country. Asked his opinion by the Committee of the House of Commons on Navy Estimates, Mr. Elgar considered that, as the contractors could build a merchant ship more cheaply, so the Dockyard had the advantage in building ships of war. He expressed himself well satisfied with the Dockyard workmen both for skill and diligence.

As to the time occupied in building we have achieved immense reform. We have been making steady progress for some years in accelerating construction; but the "Trafalgar" has eclipsed anything that had before been achieved. It is hoped that she will be ready for the pennant next June, or three years and six months from the time when the keel was laid. Certain it is that the British Dockyards compare favourably with those under foreign administration. In Italy the "Duilio" and the "Dandolo," laid down in January, 1873, were ready for commission in January, 1880, and March, 1882, respectively. The "Italia" and "Lepanto," laid down in January and September, 1876, were ready for commission—the former in October, 1885, the latter in May, 1888.

Turning to the French Navy, the ironclads now in construction—the "Neptune," laid down at Brest, and the "Magenta," at Toulon, in October, 1880—will not be ready for their trial before 1890. The "Formidable," laid down at L'Orient, and the "Amiral Baudin," at Brest, in December, 1878, will be ready for their trials in the present year. The "Hoche" and the "Marceau"—the one building in the Dockyard and the other by contract—were both laid down in 1880. The "Marceau" will be ready this year. The "Hoche" is $\frac{2}{100}$ ths short of completion. The delay in completing in France is more striking still in the case of smaller vessels. Of the four armoured gunboats laid down in 1882, one of 1,640 tons and one of 1,050 tons will be ready this year; another pair, one of larger and the other of smaller size, will be advanced to $\frac{2}{100}$ ths and $\frac{1}{100}$ ths respectively. The torpedo cruiser, the "Vautour," of 1,250 tons, commenced in 1882, was only completed for sea in 1888.

It is difficult to compare the cost of work in the French and English Dockyards. In the French Dockyards the number of workmen is 21,000, and their average earnings are 40*l.* a-year. The number of workmen in the English Dockyards is 18,047, and the average earnings exceed 65*l.* a-year. With this remarkable difference in the scale of the wages, the cost of building appears approximately the same in the two countries.

In comparing a Dockyard with a private establishment we must always keep in view that our establishments are primarily intended to deal with emergencies and for the general purposes of the Fleet. There must be a larger expenditure on various services than is strictly necessary to carry out the work of mere building in ordinary times. In late years, more particularly under the present Board of Admiralty, improvements have been effected in Dockyard administration. While recognizing that much has been achieved, there is still room for improvement. Money is wasted on the maintenance of ships practically useless for the defence of our shores and our commerce in the event of war. The steam basins have been filled with vessels efficient only for peace purposes, in process of refitting at great cost for the relief of other vessels of similar type, which it has been the inherited policy of the Government to keep in commission for the police of the seas. Progress has been made in cutting down the cost of repairs and refits. For a further and considerable retrenchment we must look to a radical reform in the constitution of our foreign squadrons. On the Australasian station and China no material reduction may be possible. On the East Indian station the trying work of the Red Sea, or some portion of it, should be handed over to the Indian Navy. Lascars are better fitted to contend with the climate than crews of Englishmen. Elsewhere the vessels permanently kept on the stations should be reduced. Our flag should be shown, and the Navy should be trained in flying squadrons. A system similar to that so long maintained in the British Service has been followed under the French Administration, and it has been most strongly condemned by the ablest naval writers in France.

LORD BRASSEY: I greatly regret that it has not been possible to circulate the print of this paper beforehand, as usual. I only returned to England six hours ago.

ADMIRAL COLOMB: We must regret that a paper of this kind was not in our hands before, as it is one which deserves closer criticism and fuller argument than it is possible to give to it when we hear it for the first time. The noble lecturer led off by raising that fine discussion, the question of the armoured water-line—a question we have discussed over and over again in this theatre, and I cannot see that we are one whit nearer the solution of it now than we were twenty years ago. To my mind that has been a question for the decision of experiment long ago, and nothing but experiment will settle it. I am satisfied myself that the necessary experiment is not a very expensive, and need not be a very prolonged one. We do not know at the present moment what chances there are of the water-line being hit in dangerous places according to the proportion of shot which is fired at the ship. We have really only one experiment: that is the capture of the "Huascar" by the two Chilean ships. She sustained a very heavy fire from 12-ton guns, and no shot struck her between wind and water, that is to say, the necessity of a water-line belt was not impressed upon us by that one experiment, the only experiment that we have that I know of. I believe myself that it is very difficult for a rifle shot to strike at that point which used to be called "between wind and water." In the old wars a shot very seldom struck between wind and water, and we know this much, that with round shot it is much more easy to strike between wind and water than it is with rifled shot. The rifled shot invariably on striking the water flies up to a great height, generally clean over the ship, whereas the round shot, if it struck a little short of the ship, took a small bound, and was very apt to strike near the water-line. Those are facts that we know; to get more we should, I consider, put up a

target and fire at it every day for a fortnight, and try to strike the water-line with a given number of guns of different calibre, and to ascertain exactly what danger there is. When we have ascertained what danger there is, it seems to me that we shall be in a much better position to decide that great question. As long as we do nothing but express opinions about it—which we have been doing for twenty years steadily—I do not quite see how we can get any further. I quite agree with Lord Brassey in deprecating a too sharp criticism of the work of the naval administration of this country. I think, while it is perfectly right and very valuable that those of us who profess to know something about it (whether we do or not is another question) should offer criticisms from time to time, making those criticisms as valuable as we can, still I deprecate the sort of *prima facie* hostility to an administration which sometimes colours the discussion of this subject. Those who know what goes on know very well that the public servants, both in the Admiralty and in Dockyards, are almost as a universal rule doing their very best; and, as a rule, they are doing their very best under considerable disabilities. In a country governed as we are by a wayward House of Commons, it becomes exceedingly difficult for those who know the truth to tell out that truth into action without deviation from one side to the other. Lord Brassey has criticized the crowds of obsolete ships which a little time ago were to be seen in our Dockyards. They are almost disappearing. I have myself been a hostile critic against those classes of ships, but, after all is said and done, I do not think that the thing could well have been helped. A great battle had to be fought between the old propulsive power and the new propulsive power, and there was no way of fighting it out except by that continued experiment which, as all continued experiments do, developed a very large number of failures which decorated the Dockyards as Lord Brassey has told us. But that time has passed away. Steam has won the battle against sail, and every one's mind has become clearer now that that battle has been fought and won. As to the actual necessities of our ships, no person who has been observant of the shipbuilding policy of the Admiralty for some years past can doubt that we are coming to more steady types of ships, if I may say so—coming to more reasonable arrangements in the ships themselves, coming, in fact, to a time when we shall have patterns suitable to steam propulsion in the same way as we used to have patterns most suitable for sail propulsion. Lord Brassey has spoken once or twice with the great vigour, clearness, and force which accompanies most of what he says, on the plan which we adopt of stationing our ships not so much in squadrons, but more separately on the different stations. I am not sure that I wholly go with him in his view that there ought to be less of the separate station and more of the squadron station. My experience of squadron work is that a little of it goes a good way. Though it is perfectly right that all Officers should be accustomed to work in squadrons, because in the heavier classes of ships, in battle-ships, all the work is done in squadrons, yet it does not follow, and it did not follow in times gone by, that all of the work of the Navy was done in that way. It has been remarked to me once or twice, and I think that there is a great deal in it, that our practice of separating the ships, leaving Captains to their own devices, throwing the responsibility on their own hands, and taking away from them the power of appeal to the Admiral, is a good thing for the Officers. I believe the number of small vessels which we have had in our Navy, throwing great responsibility, sometimes on comparatively young Officers, has developed in the British Officer a quality which we do not see in those of other navies, and which other navies fully acknowledge, that is to say, a freedom from fear of responsibility. This characterizes the British naval Officer, as far as I have studied him, over the naval Officer of any other country. I should be very sorry to see the British naval Officer commonly put under the command of the superior Officer. Give him as much of the squadron work as is necessary, which is now done on all stations, but do not suppose that you can train the British naval Officer, as a rule, in squadrons. There is one other point which I ought to speak about, as Lord Brassey did me the honour especially to allude to my views on that subject, and that is placing the turret in the rear of the ship instead of in the front in the case where there is but one. My own view for a great many years past has been that in the "Hero," and that class of ship, the proper place to put the turret is in the rear and not in the front. I have never been able to see why the turret

was placed in the bows of the ship. The only advantage that a ship can possibly get from it if she is chasing an inferior ship is that she will be able to fire on her without material yawing. But the time occupied in loading these heavy guns is so great that this is not a very material advantage. When her turret is placed astern instead of in front she will be able to chase at full speed without the guns being washed down as they now must be, and a very slight yaw, a yaw of three or four points at the outside, will give her on the vessel ahead of her the full power of her guns. But, on the other side, in the one experiment we know about, the capture of the "Huascar," we saw the great evil of placing the turret in the front of the ship and not in the rear. That ship was attacked by a superior force. She made a wonderfully gallant fight, but she was absolutely handicapped because she had to fly and at the same time to fire at her enemy, and she could not do both. It was necessary for her to turn out of her course considerably every time she wished to fire at the enemies following her astern. If she had been with her turret astern she might, I verily believe, have saved herself altogether. It was the accuracy and difficulty of her fire which prevented her from making good her escape and enabled the enemy to capture her.

Admiral the Right Honourable Sir J. C. D. HAY, Bart.: I shall not occupy ten minutes, nor do I propose to enter into all the very valuable points which are discussed in the paper, but there are one or two to which I should like to call the attention of the meeting, and which, I hope, may at least lead to further discussion on those particular parts of the paper which to my mind are very valuable at the present moment, when we understand that there is to be a Bill introduced into Parliament for the purpose of increasing the Navy, none too soon. I agree with the noble lecturer in the value that he places upon the "Polyphemus." The "Polyphemus" is a ship that can go 18 knots, and, I believe, that if the gold medal of this Institution were offered for a scheme to be propounded by naval Officers by which the "Italia" and her sister ships could be captured, we have no other ship in the Navy at the present moment which is capable of keeping up with the "Italia" or the "Lepanto" at their speed of 18 knots, and at the same time doing anything in the way of injuring them. Therefore I think it is necessary that we should have more "Polyphemuses." I hope we are not going to war with Italy, but if we were we have no ships in the Navy that can go 18 knots and carry guns of an equal weight and power to those carried by the four great Italian ships. I observe the lecturer states that the number of battle-ships must be limited because they cost 800,000*l*. I think I am reducing his sentence absolutely to what it means. Well, they must be limited, of course, because they cost 800,000*l*., but they must be limited by the necessities of the country. We require as many battle-ships as all the rest of the world combined. We have a Return before Parliament which states—I assume it is accurate—that we have forty-nine battle-ships at this moment, of which eight are inefficient from want of repair; but I see in the Report lately made by Sir William Dowell and his colleagues, it is suggested that they should be repaired at the cost of a million of money. However, at this present moment they are inefficient; and there are seven, which, I understand from the statement of the First Lord of the Admiralty, being over twenty years old may be considered as past work. That leaves us thirty-four. The French Navy in the same Return is stated to have thirty battle-ships plus six which are called coast defence ships, but which steam 14 knots, which have large coal capacity, are as powerful as any of ours, and are always recognized as making up thirty-six French ships, from which we must deduct four as inefficient and three as old, reducing the French ships with the same kind of reduction that we have allowed for the British Navy, to twenty-nine. Then the Russians have nine, from which we must deduct one, reducing them to eight. The Germans have thirteen, from which we must deduct three similarly, reducing them to ten. The Italians have twenty-one, from which we must deduct nine, reducing them to twelve. Spain and Turkey are not given in the Return, but from authentic sources we find that the one has four and the other six, thus making altogether sixty-nine battle-ships belonging to these nations. Therefore if this country, as I think it should have, is to have the same number, that is sixty-nine, we should require to build thirty-five battle-ships, which is the number I suggest to my noble friend—thirty-five at 800,000*l*. apiece, or whatever the sum may be that may be necessary, for the country to be defended,

and in my opinion the country will not be defended unless you have as many battle-ships as the rest of the world combined. It is said, of course, it is possible to repair these eight ships of the "Minotaur" class, and others, and make them efficient for a million of money. If that is the opinion of persons in authority I shall bow my head to their opinion, and that would reduce the number wanting to twenty-seven. But I am not convinced that it is so. I think these ships should be repaired, but that they are only fit for armoured cruisers and not for battle-ships, and, therefore, I come back to the number which I think is absolutely necessary to the country, which is thirty-five battle-ships to be completed. If those thirty-five battle-ships are completed, I believe the ordinary building of the Navy, three millions, which I think my noble friend suggests, will be sufficient to give us an efficient Navy, but we must have an extra expenditure of something like twenty-seven millions to give us the thirty-five ships which are necessary for our safety. I am well aware that my opinion is worth very little, but I submit it to the investigation of those who are interested in the matter to find out how, if we were at war with two great Powers, such as France and Italy or France and Russia, we could manage to keep them in order and to protect ourselves entirely, unless we had such a preponderance of power as that which I suggest. I think that this country should possess one battle-ship for every battle-ship in the world which could possibly be opposed to it, and then, under any circumstances of one, two, or three Powers being united against us, we should have such a preponderance that we could sweep the sea. Therefore it seems to me that that should be the object at which we should aim, and that is the limit to which my noble friend's 800,000*l.* should be extended, in order to meet the defence which is necessary for the country. I agree with Lord Brassey's remark as to the "Nile" and "Trafalgar," except this, that if these ships are a type to be adopted, or if the "Victoria" is a type to be adopted, they should in my opinion have the sea-going advantage of the high bow upon which my noble friend has laid such stress, but they ought also to have the speed of over 18 knots at whatever cost, in order that the Italian ships, or the Russian ship now building of that speed, or the "Amiral Baudin," or any other armour-clad should be caught by, defeated by, arrested by, and brought into port by the British ship. My gallant friend Admiral Colomb has laid down some theories with regard to the number of shot which would strike a ship, in which I have no doubt he is accurate. A very small number of shot do strike a ship. The very best frigate action ever fought was the action between the "Chesapeake" and the "Shannon." It may astonish people to know that these ships having been fought in the most determined manner and with the greatest gallantry, there were only forty-nine hits in the "Shannon" after she came into Halifax. She was only struck forty-nine times by the best Commander and the best fought frigate that ever fought an English frigate. It may occasionally happen that a ship may be sunk, but as a matter of fact they haul down their colours before that stage is arrived at. I trust that these ships, which have their protected line below water, will be very useful, and that they will not always remain in that condition. I do not despair of them. What I did object to was the designers of those ships saying that they proposed to build a ship that should have protection, and when the ships were launched we found this protection under water. That is a faulty design which cannot be defended. I dare say it is a very difficult thing to design a ship, and I am aware that additional weights come to be put into them for which they were not originally intended, but additional weights ought to be contemplated, and there is a mistake somewhere if ships are launched not fulfilling that amount of protection which their designers intended. It is only on that ground that I conceive we have any right to challenge the value of these ships, which, I believe, will do good service to the Navy.

Captain CAMPBELL, R.N.: Perhaps I may be allowed to make one or two remarks on the paper which has been read, as I happened to have the honour of serving as Commander of the "Alexandra" for three years, which vessel has been referred to as typical on the question of the turret being aft instead of forward, in order to drive the ship at speed against a heavy sea. Steaming in the "Alexandra" against a gale in really heavy weather was one of the most fearful things I have ever witnessed. The seas would come in clean over the bows: the structure forward was not sufficient to keep them out, and great difficulty was experienced in getting the

water off the ship afterwards. I believe in the "Dreadnought," and vessels of that class, they get on against a gale of wind very much better than the "Alexandra" with all her top hamper and deck batteries would do. I see Admiral Colomb says the turret ought to be in the after part of the ship, but I hope in future we shall have turrets in both parts of the ship. I do not think we shall very often have to fight a stern fight running away from the enemy, and we shall still want the turret in the fore part of the vessel for chasing purposes. I cannot quite agree with Admiral Colomb that the yaw of the ship is not a great loss to a vessel chasing another—it would be very much better if it could be done without. Coming to the whole question of national defence, we were told only yesterday in another place that what is called "warlike preparation" abroad is only "peaceful precaution" at home, but to my mind those terms are synonymous, because we know perfectly well to preserve peace we must be in absolute preparation for war, and that is the only way it seems to me that we shall maintain the former state. The other day Admiral Colomb said in this Institution—he will excuse me referring to him so often—that we do not know what we want, that is, I think, the expression he made use of. What we want is to be able to keep the enemy's ships in their ports all over the world, no matter what war we may be waging at the time. That is the measurement I should use for the strength of the battle-ships, you must have battle-ships; as long as you have large guns to fight against forts you must have large carriages to carry them about in safety. After that you want a very large number of ferrets, because I believe British Admirals in the future will not wait blockading outside all the time, but they will shove in their ferrets and rout the enemy out somehow or other. You will want plenty of ferrets to do that. Then naturally there will be some of the enemy's vessels that will escape—those fast cruisers that we all hear are going to destroy our trade; and you will require these hounds in the shape of your cruisers to catch them and take them into port. These, therefore, are the three things I think most necessary in any policy of naval shipbuilding, which I am glad to say we are likely to be studying very soon. There is another thing which I should like to say, that has little reference to the maritime part of the subject, as it is called into question by the large audience in this theatre, but I hope that it will not be very long before the members of this Institution are enabled by the Government, when a large number of ladies and gentlemen come to hear such papers as we have listened to to-day, to have better accommodation in a larger theatre.

Admiral Sir E. FANSHAW: As reference has been made to the performance of individual ships at sea, with a view to illustrate the respective merits of a high bow and the lower bow of the "Devastation" class, I may mention that when I was the Admiral at Portsmouth the "Devastation" arrived from the Mediterranean. She had very heavy weather as far as Gibraltar; and having stayed there only time enough to coal she came on to England against a heavy gale the whole way. She arrived on Saturday night, and it was my business to inspect her on the Monday morning, she coming into harbour to be paid off. She had been on a foreign station, and, I believe, in commission three years. She had steamed from Gibraltar to Portsmouth against a head sea, and all the fore part of the ship had been freely washed over by heavy seas the whole way. I went all over the ship. The seamen's mess-place in the fore part of the ship was described to me as having been the whole time perfectly dry. It was immediately under this part that was washed by the seas. I asked if no leakage had come in, and it was answered that there were only a few drops from the corner of a skylight which was battened down. They had had no time to clean bilges or do anything else than open the hatches for ventilation; yet I could hardly detect the slightest smell in any part of the ship. I could not help comparing this in my own mind with what would have been the case under similar circumstances with an old line-of-battle ship: which, instead of being a few days coming up from Gibraltar, would have been at least a month. I mention this as bearing upon the question of low bow ships behaving well in a head sea in heavy weather. I should like here to say how entirely I agree with what was stated about a strong Navy being conducive to the maintenance of peace. We often hear it said that the people who clamour for a strong Navy are bellicose naval Officers who wish to make war; but everybody who has intelligently considered the subject knows that a strong British Navy is the surest guarantee for the

peace not only of this country but of Europe; and I will add that we should not have lived for the last six or seven years in a feverish expectation, year by year and month by month, of a great European war; if England had, backed by a strong Navy, asserted with authority that peace should be maintained.

Admiral BOYS: I have not had the opportunity of seeing the paper, and we naval Officers, as a rule, are not quite capable of taking up a question to argue it at first sight, at any rate that is my case. I only rise to make one or two remarks; and, as Lord Brassey has asked for the expression of any difference of opinion, perhaps I may be allowed to put them. Lord Brassey, I see, advocates generally a reduction in the crews of our ships. Well, I must say, as a naval Officer, I would not take one single man out of any ship, for in a great many circumstances our crews are not only not excessive but insufficient. If there were sickness on board, or if some men were detached on duty, such as prize crews, we should hardly have men enough to man the guns and to perform the various duties of a ship. I believe that is the case now in some of our turret ships, that when the boats are away they have scarcely enough men to work the guns. Then about the high bows, I must say I have been rather astonished to hear the views that have been advocated by some of our leading Officers as to high bows for steaming against a head sea. In the first place, we are not to suppose that we shall fight all our actions in gales of wind or steaming against a sea. I do not think our ships should be exactly built for that purpose, but built for the occasion of fighting actions, which is more frequently the case in moderate than in heavy weather. I can give you a practical instance of what I thought was a great triumph for the low bow. It happened to be my duty some years ago to command the "Glatton" in some experiments to be made in firing at her turret by the "Hotspur" at Weymouth. I had to take the "Glatton" from Portsmouth to Portland for those experiments. In those days these low freeboard turret ships were not supposed to be very safe to move about alone, and the "Bellerophon" was ordered to accompany as a convoy. We steamed against a summer south-westerly gale. The "Bellerophon" having to keep further out never came near us: we got to Portland an hour before her, and while she was pitching her bows into a head sea we were going through it extremely comfortably. Of course a great deal of sea came over the decks, but it all ran off again. In that case I certainly considered the behaviour of the "Glatton"—it was not a very heavy sea—was better than that of the "Bellerophon," and she was a steadier gun platform. Admiral Colomb has expressed the view that he prefers the turret in the stern. I cannot say I agree with him there. But there is another device which will shortly come forward, and I dare say Lord Brassey knows of it, and that is instead of putting the turret in the bow or stern, putting it in the middle, and having an all-round fire in all directions, perfectly clear of everything. I think Lord Brassey is aware of what I am alluding to, and I hope soon the plan will be developed and considered.

Captain CURTIS: With respect to throwing responsibility on Officers and making them act independently, I think we must all recollect the case of Commander Johnstone at Madagascar, where he was in opposition to an Admiral, and how well he performed his duty there, and with great honour. As to money, three days ago I read a review of the Indian trade in the "Morning Post," and, if it is correct, then the money must be forthcoming, and the Navy must be increased in proportion to the duty that it has to do in the protection of commerce. It states that the trade with India has increased 50 per cent. in the last ten years, and 25 per cent. in the last twenty years. I think that speaks volumes to show that the Navy ought to be increased in proportion to the duty that it has to do: to ensure and keep inviolate our Colonies and commerce, which is the very essence of naval duties.

NOTE.—Our commerce and Colonies sprung from our naval supremacy; "it is our birth-right," and it is our duty to maintain it, and it has now become our necessity to augment the naval forces.—J. D. C.

Mr. KETTLEWELL: I should like to make one or two remarks. The lecturer spoke very highly of the "Polyphemus," and I think the general opinion of naval Officers here present is that she is a most efficient vessel. The idea has occurred to me very often—of course I do not pretend to much naval knowledge, being a layman—but still I cannot help thinking it would be greatly to the advantage of the Navy if there was a special type of cruisers thought out and built for service with an ironclad

fleet, which might also take the form of the ram suggested by the lecturer. Such vessels might fulfil the two purposes, as it seems to me, very well. There would be another advantage if this were possible, which is that such cruisers would not be likely to be detached for ocean duty in time of war, thus leaving the battle fleet short of auxiliaries. An army without cavalry can do very little in these times. It seems to me, a fleet of ironclads without having a large number of efficient cruisers attached to it would be very much in the same position. Could not a class of vessel be designed which would combine the fleet cruiser and the ram? I only throw this forward as a suggestion.

LORD BRASSEY: My Lords and gentlemen, I think the time has arrived when the meeting is desirous of closing the proceedings, and I believe it is my duty to say a word or two. First and chiefly I desire to express extreme satisfaction at the numerous attendance on this occasion. I take it not as a compliment to myself. The numerous attendance on this occasion is a reflection of the general state of public opinion, and is an evidence, among the many gratifying evidences which are before us, of the interest which the country is taking in its position as a naval Power. I thank my gallant friends for the tenderness which they have displayed in the criticism of the paper which has been placed in their hands. It was unarmoured at a great many points, and might have been riddled through and through by the naval gunners. I am thankful to them for having so mercifully spared me. I would, before I sit down, say this, that one of the most practical advantages of meetings in this theatre is that they afford the opportunity for discussion, comparing individual experiences, and so arriving at wise decisions. What we have heard this afternoon is very practical upon the question of the high bow. It is evidently necessary that our ships should be able to hold their way against contrary winds and heavy head seas. The inference one would draw from reading the Parliamentary paper which has been in the hands of the two Houses for the last twenty-four hours is that those who compiled that paper were of opinion that a high bow was necessary in order to enable a ship to hold her own in contending with a head sea. But that is not the experience apparently of Captain Campbell; and he is as good an authority as any other. He has served in a high freeboard ship, and knows her behaviour at sea. I think it is very important that such an experience as that of Captain Campbell should be placed before those who are in authority, and by whose advice the designs of the new ships have been supplied. Again, it is very interesting to hear from Admiral Boys of the comparative behaviour of the "Glatton" and the "Bellerophon" in the circumstances which are described. Still further, it is interesting to hear what fell from Sir Edward Fanshawe. What, however, he did not tell us was whether the "Devastation" was steamed at such a speed as might be required of her in war on the passage from Gibraltar home. No doubt, if you ease down you keep safe on these low freeboard ships; the question rather is whether there must be a greater loss of speed, when speed might happen to be very necessary, with the low freeboard as compared with vessels having higher sides.

ADMIRAL SIR E. FANSHAW: I think I can answer that at once by saying from recollection I believe the "Devastation" came from Gibraltar to Portsmouth at the average speed of 8 knots.

ADMIRAL COLOMB: Having commanded the "Thunderer" under precisely similar circumstances, I might not be out of order in saying that I have had the "Thunderer," the sister vessel, in a gale of wind, and we have not been able to drive her at more than 3 or 3½ knots, simply because we were being buried.

LORD BRASSEY: Well, there it is—the doctors disagree and there must be a further consultation. In the meantime it is a very important point. We all agree that we want to have vessels which can be depended upon for certain results, I do not mean to say in extreme tempest, but in that sort of weather which is very commonly experienced.

ADMIRAL SIR E. FANSHAW: That is the difference.

LORD BRASSEY: And I have no doubt that what is said here will be regarded as of value by those in authority. I have no doubt they will push their inquiry and arrive at a wise result. I must not pursue this subject further, but simply say I appreciate it as a great honour to be invited to produce a paper for consideration at this Institution. I beg to add, before I sit down, that I feel very much indebted to

my gallant friend Lord Clanwilliam for having given his sanction to these proceedings by taking the chair.

The CHAIRMAN : It is rather late, so I will not go into this paper, which we unfortunately did not receive till too late to study. It now becomes my pleasant duty to move a vote of thanks to Lord Brassey for having kindly given us this very interesting lecture.

NAMES OF MEMBERS who joined the Institution between the 1st January
and the 31st March, 1889.

LIFE MEMBERS.

Bruce-Kingsmill, J. C. de K., Lieut. R.A.	Anderson, J. H. A., Capt. Manch. Regt.
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MacFarlan, F. A., Lieut. Q's. O. Cam. Highrs.	Lance, F., Col. Ben. S. Corps.
MacFarlan, W., Lieut. 2nd Bn. Royal Highrs.	Cave, George E., Sub-Lieut. R.N.
Wilde, E. T. R., Col. 1st Tower Ham. Vol. Bde.	Dalgely, R. W., Col. York and Lanc. Regt.
Cave, John H., Vice-Admiral.	Napier, Robert A., Lieut. R.N. Reserve.
Barnes, E., Lieut. R.A.	Elphinstone, H. J., Lieut. The Highd. L.I.
	Eden, W. T., Col. late Bom. Army.

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Ethelston, A. P., Lieut. R.N.	Banbury, W. E., Lieut. Mad. S.C.
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Campbell, L. W. Y., Lieut. 25th Regt. Mad. Inftry.	Knocker, H. P., Major R.E.
Fraser, H. A. D., Lieut. R.E.	Macgregor, C. A., Major late R.E.
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McKirdy, John, Comr. R.N. Reserve.	Jones, H. S., C.B., A.D.C., Maj.-Gen. R.M.L.I.
Glyn, A. St. L., Lieut. 5th Bn. Rl. Fus.	Brine, B., Col. R.E.
Duke, O. T., Capt. 5th Bn. Rifle Bde.	Pearse, H. W., Capt. E. Sur. Regt.
Hill, H. B., Lieut. R.A.	Leslie, G. F., Capt. Rif. Bde.
Langley, Gerald C., Capt. R.N.	Western, J. S. E., Capt. Mad. S.C.
Maclean, A. D., Lieut. late R.A.	Daniell, J. F., Capt. R.M.L.I.
Inches, C. J., Fleet Eng. (retd.) R.N.	Paget, A. W., Comr. R.N.
Whitehead, G., Lieut. 24th Middx. Rif. Vols.	Pilcher, A. J., Lieut. R.E.
Cowans, J. S., Lieut. Rifle Bde.	Harrold, A. L., Major South Australian Mil.
Mayhew, C. G. A., Lt.-Col. N. Midld. Vol. Bde.	Macfie, W., Col. 3rd V.B. L'pool. Regt.
Hendrie, J. S., Capt. Canadian Arty.	Castle, W. H., Capt. 2nd V.B. Middx. Regt.
Cox, J. B., Maj.-Gen. Ben. S.C.	
Gunning, R. H., Capt. K's R. Rifle Corps.	

OCCASIONAL PAPERS.

This portion of the Number is reserved for Articles, either Original or Compiled, on Professional Subjects connected with Foreign Naval and Military matters; also for Notices of Professional Books, either Foreign or English.

It is requested that communications or books for review may be addressed to Colonel Lonsdale Hale, at the Royal United Service Institution, Whitehall Yard, London, S.W.

THE CAMPAIGN IN THE NORTH SEA AND THE BALTIC.

(Eight articles from the *Moniteur Universel de Tours*. By RENÉ DE PONT JEST, 1870-71.

(I have thought it worth while to offer these articles in an English form to the Journal, as they throw so much light on modern naval warfare, on the thoughts and feelings of the Chiefs engaged in it, and on the circumstances and influences which governed their decisions.—P. H. COLOMB, *Rear-Admiral*.)

FIRST ARTICLE (*Moniteur Universel*, November 24th, 1870).

A GREAT many French and foreign newspapers have within the last few days announced that our North Sea squadron had forced the entrance of the Jade,¹ captured the Prussian Fleet, and was preparing to bombard Hamburg. They even gave, respecting the first of these exploits, precise details in adding that the flagships "Surveillante" and "Gauloise" had been sacrificed, and that they had sunk, opening the passage to the other ironclads.

Such news one can understand caused everywhere a great sensation; but confirmation of it was vainly sought in the *Moniteur Universel*. It refused to welcome lightly a rumour which could only be a fable, for unfortunately nothing which had been credited to our Navy either was true or could be true.

The Northern fleet being still composed, as in the early days of the expedition, of ships of heavy draft of water, the approach to the enemy's coast, studded with shoals, was for them impossible, and Vice-Admiral de Gueydon, in spite of his energy, had been obliged to content himself, as his predecessors Vice-Admirals Fourichon and Bouët-Willamez had done, in blockading the Prussian ports, and falling on the merchant ships which attempted to put to sea or to approach their coasts after the first departure of the squadrons.

This feigned departure—for it is proper to call it so since Admiral Bouët, after having returned to Cherbourg on the 19th September last, only stayed

¹ Within which lies Wilhelmshaven.—TRANS.

there long enough to complete his ships—this feigned departure had been a very skilful manœuvre, but the Commander-in-Chief of the Prussian Fleet was not to be taken in by it. He continued under shelter at the bottom of the bay of the Jade, whilst the merchant navy, more bold, sent out from Bremen, Hamburg, and Lubeck a great many ships. At the same time the Prussian ships which were sheltering in British ports put to sea to gain the coast of Hanover, where they hoped to arrive safely and without difficulty.

This was not counting on the return of our frigates; and as on their approach the Prussian Maritime Authorities judged it prudent to again extinguish the lights, and to remove the buoys which had been replaced at the mouths of the Elbe and Weser, the German ships which were outside had no resource when they saw the French flag but to surrender or run ashore. Those who, more daring, attempted to get into the river or into the bays, ran upon the submarine mines which had been submerged for our benefit, and sunk under the eyes of those for whom the engineers of King William had reserved this sort of death. Thus, thanks to many circumstances, the losses suffered by the commercial marine of Prussia had been immense, especially during the last weeks. More than thirty ships certainly had been captured or lost, ships and cargoes, and it is not exaggerating to estimate the German losses by the blockade since the end of July at five millions of francs a day.

We can, then, easily understand the exasperation of the German trade against the French Navy. The great cities of the Weser and the Elbe, which had monopolized the transit between the east of Europe and America, suffered particularly, and thence sprang, no doubt with the design of raising in their favour the sympathy of the English merchants, the eagerness with which was spread the rumour of the approaching bombardment of Hamburg. This old free town knew in fact that France had a sound memory, that she remembered with what enthusiasm her Chamber of Commerce had spontaneously voted ten millions of subsidy for the war, and that if a favourable opportunity offered our fleets would be without pity for her. But for the moment she might be without fear; but God knows what the future may present for the Prussian littoral, and if the war continues the Hamburgers may be certain that they will not be forgotten, and that the interest on their ten millions will be paid to them with the same care as the liberated country will devote to all her accounts.

This explanation relative to the later operations of our squadrons having been made, I now retrace my steps to give a rapid history of this campaign in the North Sea and in the Baltic, from the day that the ironclad fleet left Cherbourg up to the time when the disaster of Sedan came to take away from Admiral Bouët-Willaumez the feeble initiative part which the formal orders of the Government had left to him, orders renewed, so to speak, in each of the rare telegrams which the then Minister of Marine, Admiral Rigault de Genouilly, addressed to the Commander-in-Chief of the Baltic Fleet.

This history is absolutely necessary, not only to set right in the interests of truth all that has been said and written so recklessly in regard to this expedition, but still more to prove that our Navy has never ceased for an instant to be at the head of that painful mission which it has been hers to fulfil.

Placed officially near Vice-Admiral Bouët in order to follow the naval operations, I am better able than anyone else to trace them out day by day, to judge of them from the point of view of a professional man, and to show that the squadron was always as much hindered in its movements by the instructions and the hesitations of superior authority, as by the political circumstances which were produced by the absence of frequent and certain news from the seat of war, and finally by the composition of the fleet in respect of the coast against which it had to operate. It is easy then to see

that the French Navy has seldom had a rougher or more ungracious task to fulfil, and that if the expedition was useless in a military sense, it can only be put down to those who had as ill understood the means proper to employ, as the end it was proposed to attain.

Vice-Admiral Bouët-Willaumez, a man of action and energy, found himself immediately reduced to forces at once imposing and insufficient, in spite of the promises that had been made to him, and his squadron, like the later one of Vice-Admiral Fourichon, found itself condemned throughout long weeks to an inaction that the Officers and ships' companies would have willingly changed for military operations. It required less courage in the fleet to fight than to support the fatigues, the dangers, the vexations, the privations of all kinds which were imposed on it, and for which the two valiant chiefs are now only recompensed by criticism, as false as malicious, which reflects on the whole Navy.

We proceed, then, to take the fleet from the moment of its departure, and to follow it in its principal movements and under the several Chiefs which have commanded it up to the 19th of this month, that is, up to the day when the Division of Rear-Admiral Penhoët returned to Cherbourg, while Vice-Admiral de Gueydon returned to Dunkirk towards the North Sea with his squadron.

SECOND ARTICLE (November 25th).

For several days after war had been declared, it was not known what General Officer would be placed at the head of the important expedition which was to be sent to the Baltic. It was said that Admiral Rigault de Genouilly, the Minister of Marine, wished to assume this command himself, and as a fact, the completion of the frigate "*Océan*," destined to become the flag-ship, was hastened.

Several days passed in this state of uncertainty, when, on the 22nd July, Vice-Admiral Count Bouët-Willaumez suddenly learnt that the Emperor had chosen him as Commander-in-Chief of the Baltic fleet. The Minister of Marine had declined the appointment; the obligation of giving up his seat in the Ministry having been rigorously imposed upon him in case of his accepting it. He informed Vice-Admiral Bouët-Willaumez that the fleet put under his orders would be composed of fourteen ironclads, a great number of small vessels, and other vessels proper for the expedition. A second fleet, under the command of La Roncière le Noury, and made up of heavy steam transports, of gunboats, and floating batteries, would follow after a short delay with 30,000 men for landing under the orders of General Bourbaki. On the morrow of his nomination, Vice-Admiral Bouët-Willaumez proceeded to Cherbourg and hoisted his flag on board the "*Surveillante*," an ironclad hardly completed, in spite of the zeal displayed by Vice-Admiral Roze, the Préfet Maritime. Nearly everything was wanting in Cherbourg Dockyard, neglected as it had been for several years by the Ministers of Marine, who had stripped it to the profit of Brest and Toulon, their birth-places or their choice. Not only were the armaments and stores insufficient in quantity, but there were not men enough—war having been declared at the moment when the seamen of the Inscription Maritime, that is to say, those immediately available, were nearly all at the fisheries on the banks of Newfoundland, and off the Coasts of Scotland.

Admiral Rigault was, moreover, not ignorant of these difficulties, for alone amongst Ministers he had the courage to declare openly in Council that he was not ready. We may at least do him this justice.

However, Vice-Admiral Bouët did not the less hasten his preparations for departure, although there was already no more talk of the fourteen ironclads and the numerous small vessels of which the squadron was to be composed.

The few moments that had elapsed since his nomination had sufficed to considerably modify the arrangements of the superior authority.

Did not the Minister of Marine desire to give to the fleet, commanded by another, the importance which it would have possessed under himself? Was it immediately perceived that more had been promised than the dockyards were able to furnish? Is it true that in face of Prince Napoleon's determination to command the landing force placed under the orders of General Bourbaki, and the impossibility of permitting it, this indispensable element of success in the Baltic Expedition had been given up? Finally, is it certain that this famous landing force was officially composed only of the 10,000 men of the Marine Infantry? As I understand it, we must say yes to each of these important questions; events have shown it too plainly.

Vice-Admiral Bouët-Willamez throughout only believed in the delay of the projected armaments, and, forced into action, he determined to sail from Cherbourg with his squadron reduced to seven ironclads and a single cruiser.¹ It is true that he was formally promised that his fleet would be speedily reinforced by six other ironclads, five cruisers, the monitor "*Rochambeau*," and the ram "*Taureau*." The instructions from the Minister of Marine spoke only of the colossal northern fleet as if it had been complete and ready to assume the offensive. Thus, he wrote to his Commander-in-Chief under date 23rd July:—

"You will proceed first towards the Sound, whither you will detach the '*Thetis*' to Copenhagen, then, by night, you will return to the Jade to blockade the Prussian squadron there. When the other ships are dispatched to you, you will leave one division before the Jade, under Rear-Admiral Diéudonné, and you will proceed with the other to the Baltic."

These instructions contained some information respecting the Prussian fleet commanded by Prince Adalbert, then they concluded with a formal order forbidding the attack on open towns.

All, in fact, seemed to have been foreseen—even the difficulty which might arise in finding pilots for the Baltic. A Captain, M. de Champeaux, had been sent to Denmark, and, thanks to his intelligence and zeal, the Danish pilots were ready to give their services to our squadrons; the signal stations on the coast of Jutland had received instructions which enabled them to communicate with us by means of cypher signals, and Kioje Bay, south of Copenhagen, on the east of the island of Zealand, was chosen as the base (*lieu de ravitaillement*). Moreover, the Admiral received as a reserve fund the sum of 200,000 fr.

Finally, as a last detail, most interesting when considered with these preliminary orders, Vice-Admiral Bouët-Willamez was invited to keep an eye on Russia at Cronstadt, which proves that already there was mistrust as to an alliance between Berlin and St. Petersburg. This is so certain, that the Minister added, in a second despatch:—

"In view of eventualities with regard to Russia, orders have been given to the Mediterranean squadron to rendezvous at Brest, so as to sit astride (*rester à cheval*) of the Straits of Gibraltar and the North Sea."

It may be seen that on these Ministerial instructions the first point for the operations of Admiral Bouët was the Jade, where the Prussian squadron was said, though without certainty, to have sought refuge. The Commander-in-Chief hoped that it was untrue, and that Admiral Adalbert was at sea, where he might be overtaken and offered battle. In this expectation he settled, immediately before leaving Cherbourg, a plan of a ramming attack, with which he made each of his Captains acquainted.

¹ The word is always "*aviso*," but the author evidently uses it in a general rather than a technical sense.

Vice-Admiral Bouët-Willamez knew that Prince Adalbert had under his orders three ironclads, one monitor, and that he had his flag in the "König Wilhelm," that is to say, in a ship superior in speed and gun-power to any ship in our squadron, and against whose plates most of our projectiles were powerless. The "König Wilhelm" was built in England; she is armed entirely with 24-cm. guns, and the "Rochambeau" was alone fit to engage her. But the "Rochambeau," on the 23rd July, though she had cost France twelve millions, was still incomplete. Our Engineers, in order to admit none of the qualities of the American monitor,¹ had discovered so many defects in her that for two years she had been carefully hidden from all eyes, under pretence that she was under repair. I must hasten to add that, whether she has been little altered, or whether there has been a complete transformation, the "Rochambeau" is now one of the most powerful engines of offence and defence which exists. I shall have occasion to speak of her again.

But, as I have just said, the Vice-Admiral could not count on her immediate support, and he had in consequence to adopt a plan of action which would paralyze the gun-power of the "König Wilhelm." In the ramming attack everything depends on the skill of the handling and the rapidity of the impulse. It was the ram of the "Surveillante" turned into a gigantic projectile which would give an account of the iron sides of the Prussian ship.

These arrangements being made, the squadron of Vice-Admiral Bouët-Willamez left Cherbourg on the 24th July, at five o'clock in the evening, under the gaze of the whole population of the town, crowded on the jetties and on the terrace of the Casino, to bid good-bye and send across the water wishes for their success and happy return.

The dispatch vessel "Jérôme Napoléon" accompanied the fleet with the view of returning to Dunkirk with news either of the battle, if the Prussian squadron was met with, or immediately after arrival at Heligoland.

Heligoland, it is known, is an island facing the coast of Hanover, 20 or 25 miles from the mouths of the Weser and Elbe, and belonging to England. It was in this neighbourhood that the French squadron was first to operate, and it was to find in the Governor of this British possession, formerly Colonel of an English regiment in the Crimea, a gentleman ready to do all he could, consistently with his neutrality, to make himself useful and agreeable to his old companions in arms and in victories.

THIRD ARTICLE (November 26th).

Furnished with all these instructions, of which I have given a brief *résumé*, and once more assured by a last Ministerial dispatch with respect to the promptitude which would be used in forwarding the promised means of action, Vice-Admiral Bouët then was away from Cherbourg on the 24th July. His squadron comprised the "Surveillante," flag, the "Gauloise," flag of Rear-Admiral Dieudonné, the "Guienne," the "Flandre," the "Thétis," the "Jeanne d'Arc," and the dispatch-vessel "Cassard." The crews of most of these vessels had been completed by seamen so hastily embarked that there was not even time to furnish them with complete kits. But the guns were well manned, and as the Commander-in-Chief had but one design—to chase and bring to action the enemy's fleet—he did not with less confidence make his way at full speed to the north-east, to pass the Straits. On their departure from Cherbourg roads, the ironclads had been formed in order of battle, and everything was ready on board for clearing decks for action.

¹ The "Rochambeau" had been the "Dunderberg."—TRANS.

On the next day, the 25th, the "Galloper" light-vessel, on the English coast, signalled the passage of the French squadron, which enabled Prussia to learn that her enemy drew near, while the whole of France, thanks to the injunction which had been put on the newspapers, did not know that her fleet had sailed.

It was, doubtless, on this account, that Admiral Bouët failed to meet the Prussian Fleet, either during his passage to the north or on cruising on the coast of Hanover to reconnoitre the Jade roads. The pilots assured him that Admiral Adalbert had gone to the Baltic to take refuge at Kiel, but M. Kraetzer, the interpreter, rightly thought the other way, that the Prussian Government was unable to assemble the squadron at Kiel, at least while uncertain as to the attitude of Russia.

This early uncertainty, which lost our squadron precious time, was the more vexatious as Admiral Bouët was without the Danish charts which should have been supplied to him before his departure, and without which it was, so to speak, impossible for him to get within useful distance of coasts where the lights had all been extinguished.

He decided, therefore, to push on to the north, above all since he learnt from his Captains that most of his ships were not complete with coal, and that some were even short. It was, consequently, important to reach the depot which had been selected and organized by M. de Champeaux.

On the 28th of July, just when rounding the Skaw, the northern point of Denmark, the squadron met this superior Officer, who came to meet it in order to beg Admiral Bouët, in the name of the French Ministry, to enter the Baltic. Denmark was ready to rise, the German party, confined exclusively to the Court, would be obliged to accede, and it was certain that the landing of the first company would be the signal for action to the Danish people, anxious for revenge on their irreconcilable enemy.

At Copenhagen, since the declaration of war by France against Prussia, the women of the upper class, as well as those of the common people, wore only French colours; in the theatres they sang nothing but the Marseillaise and the German Rhine; a subscription for the French wounded reached the sum of 80,000 fr. in a few days, whilst the subscription for the German wounded only amounted in the same time to 1,800 fr. The enthusiasm was, in short, at its height; nearly the whole Danish press ardently preached war and vengeance. We had there, in fact, an ally fully ready, to whom it would be enough to extend a hand. And this ally, it must be remembered, in spite of the error we have committed, would, perhaps, have been enough to change the face of things. With her navy better acquainted than ours with these difficult waters, better prepared for the navigation of these dangerous narrows, landings became extremely easy, and as Denmark could place 40,000 men in the field, Prussia would have been threatened on the north with an army of 70,000 men, which would have forced her to keep more than 200,000 soldiers in Hanover and Holstein, without counting the garrisons of which it would not be possible to deprive the towns on her coast threatened by our ships.

But to gain this result, it was required before all things that our landing force should show itself. The mere presence of a squadron was not enough to provoke a popular movement, and, besides, with the orders which he had received to watch the Jade, Vice-Admiral Bouët-Willamez could not yield to the desire of the French Ministry and enter the Baltic. He said this to M. Champeaux, and telegraphed at once to Paris for fresh instructions.

This dispatch had hardly gone when the Admiral received from Paris a telegram which remains certainly one of the most singular in this sad campaign.

After certain details in respect of the Service, the Minister of Marine

invited Vice-Admiral Bouët to choose a point of observation which would permit him at once to respect the neutrality of Denmark, to watch the enemy's coast, and to provide for the supply of his ships. He recommended him also, the entry to the Jade being open, to leave considerable forces there in observation.

Here were only recommendations, useless comings and goings without definite aim! This post of observation, where could it be taken up? In the North Sea, or in the Baltic? But how to watch the coast of Hanover from the Baltic, and how from the North Sea to observe what went on on the Prussian coast? Were such things possible with seven ships? They forgot at Paris, that between the Jade and Kiel were nearly 900 miles, one part of the distance through straits which bad weather rendered impassable for heavy ships. It was enough to make one suppose that there were no French charts at the Ministry of Marine, as there were no Danish charts on board the ships of the squadron.

However, Vice-Admiral Bouët awaited the instructions which he had requested from Paris, and the silence of the Minister was not explained when, on the 1st August, M. de Cadore arrived in the "Coligny." This diplomatist, charged, as it was said, to negotiate with Denmark and the other smaller Powers of the North, which could only be brought about by the arrival of an expeditionary corps and a movement of the Danish populace, renewed the application to the Commander-in-Chief to proceed to the Sound. Admiral Bouët replied to him, as he had replied to the official M. de St. Feriol, that it was impossible. However, he agreed to wait another forty-eight hours for the reply of the Minister of Marine to his dispatch, but when that time should have elapsed, it was decided to return to the Jade, as he was directed by his instructions.

M. de Cadore had to content himself with this decision, and he returned to Copenhagen, where his overtures had been received but coldly by a Court so intimately connected with Prussia and Russia by its alliances.

It was in the midst of all this that Admiral Bouët learnt that a Prussian monitor, the "Arminius," was attempting to pass the Great Belt with the "Elizabeth." He sent at once, to meet these enemy's vessels, the "Thétis," the "Guienne," the "Jeanne d'Arc," and the "Cassard;" and he was able to convince himself, by this first forward movement, that the French squadron was so constituted as to be unable to act with full advantage in waters open only to vessels of light draught.

The "Arminius" was able to shelter herself in a bay of Jutland before she could be reached, that is to say, in neutral waters, and the next day, thanks to a fog, she continued her voyage along the coast, where the French ships could not pursue her. She thus gained the North Sea and the Jade, without being again seen. As for the "Elizabeth," when her Commander knew, by means of the Prussian spies spread along the coast, that the enemy's ships were approaching, he returned rapidly to Kiel, which he did not again quit.

This is, in truth, the history, as to which there has been such an outcry, of the breaking of the blockade by a Prussian ship. The "Arminius" is a little monitor drawing not more than 8 or 10 feet of water and powerfully armed. The dispatch-vessel "Cassard" was the only one which could attempt to follow her in-shore, and the whole of her armament was but four 12-prs. and a pivot gun, whose projectiles were useless against the plated sides of the Prussian monitor. Meanwhile, this first failure showed the difficulty of chasing even merchant ships in these waters, where the neutral and the enemy's coasts are so near together as to offer a thousand places of refuge to the chase, and where the banks, reefs, and shoals necessitate minute and incessant precautions.

We shall soon see, in coming towards the Prussian littoral, that the French squadron had only met the smallest of the difficulties which it would have to conquer.

On the 2nd August, M. de Champeaux returned on board the "Surveillante," bringing to Vice-Admiral Bouët a dispatch from the Minister, which required him to enter the Baltic. Although this order was not a direct reply to his application for instructions, the Commander-in-Chief did not long hesitate, and he passed down the Cattogat in order to present himself and his ships at the entrance of the Great Belt.

The second phase of the French expedition, that is to say, the most wretched and the most dangerous, was about to begin.

FOURTH ARTICLE (November 27th).

As it is probable that, since the time when the German philosopher threw this gibe at us—"The French don't understand geography"—we have made some progress in this important science, I do not consider it necessary to describe at length, to the readers of the *Moniteur*, the part of the world in which the French squadron was to act, and I think that some general outlines will be sufficient to prevent their losing sight of it.

When the Skaw is passed and we descend the Cattogat, the interior sea which separates Denmark from Sweden, we are met by three passages opening into the Baltic: the Little Belt, to the west, formed by the coast of Jutland and the Island of Funen; the Great Belt, in the centre, between this Island of Funen and that of Zealand; and finally, to the eastward, the Sound, which separates the Island of Zealand from the Continent.

These three passages, running nearly north and south, lead directly on to the Prussian coast, but they are not all equally practicable for all ships. The Little Belt, above all, is only navigable for merchant ships of light draught, the two others alone are available for heavy ships. The Sound is more easy to pass than the Great Belt, the shoals are less numerous, and the shores offer good shelter; but ships to pass through must not draw more than 24 or 25 feet of water, otherwise they are compelled to use the Great Belt, which was the case with the French squadron, some of the ships of which, the "Océan" for instance, draw no less than 28 feet.

But the Great Belt is studded with nasty reefs, which only here and there permit a narrow passage open in all winds. It was the first time that a squadron composed of such heavy ships had attempted it. Thanks to the skill of the Danish pilots, and to the detailed precautions taken, Vice-Admiral Bouët-Willaumez succeeded in passing the Great Belt without accident, but not without anxiety, for the "Océan" for a moment had only 19 inches under her bottom. This first success was satisfactory for the hydrography of these parts, for it allowed of the correction of some errors in the Danish charts which had at last arrived, but in which the soundings were shown to be incorrect in certain places.

This first difficulty being surmounted, the squadron appeared on the 7th August in Marstrål Bay, having passed before Kiel and Fehmern. Then pursuing its way in reconnoitring the coast against which it was to act, and noting the points most favourable for landing the troops promised and expected, the Admiral visited in succession Neustadt, Wismar, and Rostock, and having refitted at Kioje Bay, appeared before Swinemünde and Colberg.

The weather was then fine, and made the progress easy, although the absence of the shore lights compelled the squadron to stand off during the night. But things soon changed, and the elements, as well as the circumstances, rapidly turned against us.

Under the supposition, in which he remained, that Denmark might at any

moment abandon her neutrality, Admiral Bouët-Willamez studied during the following days the position of Alsó.¹ It was a point easy to take possession of, and from whence the landed force might operate usefully against Alsen, that is to say, on the coast of Sleswig. Also was admirably situated for becoming a new Kamiesh; its bay is landlocked, and although studded with reefs, it is possible in buoying it with care to make it a good war port, sheltered from all the naval forces of Prussia.

This plan resolved upon, Vice-Admiral Bouët hastened to communicate it to the Minister of Marine, but his letter had hardly gone when he received the following communication, dated 7th August :—

“Monsieur le Vice-Amiral,

“Serious events have occurred on our frontiers. The Army has suffered reverses, and it is the duty of the fleet to seize with still greater energy the opportunities which may offer of injuring the enemy.

“Whilst Rear-Admiral Penhoët remains at Cherbourg with his division, Vice-Admiral Fourichon proceeds to-day for the Jade with a second squadron.

“I still recommend to you the most absolute respect for open towns, for, *apart from unforeseen operations*, it is in a strict blockade of German commercial ports that the chief means of action by the squadron will be found.

“I need not say that the country relies with confidence on the devotion and patriotism of the fleet.”

A strange letter, if ever there was one, and in which I have underlined certain words, for they seem to show that there was no longer any question of a landing force. So, the Minister of Marine gives notice of our reverses to the Commander of the Fleet, recommends him to act vigorously, reports a new fleet for the North Sea, that is to say, a second Commander-in-Chief, forbids again the least action against open towns, and speaks neither of the expeditionary corps nor of the vessels proper to facilitate blockade and to attack the strong places.

I have no wish to speak of the painful effect produced on board by the news of these early reverses, which the Prussian dispatches soon confirmed and even exaggerated. In this little space which we call a ship, where we jostle one another at each step, where one has not the refuge of isolation and resting alone with one's thoughts, and where nothing from outside comes to distract the anxieties which overwhelm, and the uncertainty which gnaws, sensations are stronger and griefs more profound than elsewhere. The squadron passed through all these agonies, which were shortly to be accompanied by the struggle without truce against the elements, and against insurmountable difficulties.

However, after receiving this sad news, Vice-Admiral Bouët was not discouraged, but hastened, on the contrary, to retrace his path on the Prussian coast, and proceeded to examine Kiel to assure himself that the port did not shelter any war ships.

He soon learnt that the only ships there were the “Elizabeth” and some gunboats. Another vessel, the “Renold” was anchored before Fredericksort, ready to be sunk across the passage already so well defended by three wooden stockades, several lines of submarine mines, and obstructions formed of fishing nets, all this at such a distance from the military port of Kiel, that even were the French ships close up to these impassable obstacles, their guns would still have been unable to reach the town.

It is known that Kiel is at the end of a narrow arm of the sea, and that

¹ Als Fjord (?).—TRANS.

before arriving there, supposing the passage free, we must pass under the plunging fire of forts raised 30 yards above the shore.

A Prussian steam pinnace, which was watching at the entrance of the bay, hastened to re-enter on sight of the French ships, and we judged, on following her with our eyes, that the passage left open in the channel was hardly sufficient for the smallest vessels. A squadron commanded like the French squadron, by skilful and resolute men, and manned like it, by intrepid crews, might well attempt to force the mine-fields, and face the heaviest batteries. One part of the force would then be sacrificed to open the passage to that which followed. But there are obstacles against which courage and the most irresistible energy are useless, and it may be easily conceived, in studying the question from a practical point of view, that if the writers who arrange at their firesides a system of fancy naval tactics, make it out as extraordinary that the French squadron did not force the entrance of Kiel—it may be conceived, I say, that Admiral Bouët-Willamez may have hesitated to throw his ships upon reefs and shoals where they would be uselessly lost. He should have had, to act against Kiel and other important places on the coast, gunboats, floating batteries, and landing forces to occupy the points reduced. But we know that he was without any of these means of action.

In quitting Kiel, the squadron continued to follow the line of coast, rounded the Island of Fehmern, and passed into the Bay of Neustadt, which, of all this part of the littoral, is far the most favourable for landing an army which has Hanover for its objective.

Having finished this examination, Vice-Admiral Bouët-Willamez was proceeding on his route to the eastward to make the island of Rugen, when he was rejoined by the "Coligny," whose Commander gave him two dispatches from Paris. The one, dated August 6th, told him to return to France immediately with his fleet, the other, dated the following day, ordered him to remain where he was.

Tired of the contradictions and hesitations which paralyzed him, the Commander-in-Chief of the squadron returned to Kioje Bay, where, determined on action, he addressed to his Flag-Captain, Captain Grivel, an order to assemble a Committee with the object of studying for itself, and clear of all outside inspiration, the points on the coast that might be attacked. Admiral Bouët did not wish to rely solely on his own judgment, he wished to have the advice of all.

This Committee was immediately formed. It was composed of Rear-Admiral Dieudonné, President; M. Duburquois, Chief of the Staff; Lacour, Colonel of Artillery; and two Captains chosen by lot, Captains Quilio and Serres, commanding the "Guyenne" and the "Thétis."

On the 12th August they met on board the "Surveillante," and the same evening their report was complete.

The following are the terms in which they expressed themselves with regard to the most important places on the Prussian littoral, and the military operations which might be undertaken.

FIFTH ARTICLE (November 28th).

It must not be forgotten, in reading this report, that it was made at a date anterior to the catastrophe of Sedan, by experienced men, outside of all political influences, of Officers whom the whole Navy justly placed amongst the most capable and energetic of its members.

In order not to uselessly lengthen the story, I will only quote the most prominent parts of it.

Alsén.—The depth of water will not permit an approach to this point

within at most 3,000 mètres, a distance at which an engagement would be useless, because of the plunging fire of the forts. Nothing is here possible without a force to land. Besides, it is most probable that submarine mine defence extends along the shore, which it would be indispensable to remove, and which could not be attempted until the squadron was supplied with the necessary materials.

Duppel and Kappeln.—Completely out of reach from the ships' guns. Too little water in the bays. We could only get at them with armoured gun-boats.

Eckernford.—It is easy to destroy the isolated batteries, but they are of no importance, and without the possibility of throwing troops on shore, the reduction of the forts would be insignificant.

Kiel.—It would be necessary to employ the whole force of the squadron. The success of gun-fire uncertain on account of the height of the forts above the shore, and the losses certain for the assailants, if they were not able to occupy the forts as they were silenced. The forts of Frederiksort being destroyed, and the squadron being unable to penetrate to the bottom of the bay within gunshot range of Kiel, on account of the obstructions, the torpedoes, and all the means of defence which have there been accumulated, the French ships would soon be forced to retire without even knowing the result of their attack.

Neustadt.—An open town and without defence, but with a bay so shallow that the French ships could not even reach with their projectiles the merchant ships which are anchored some distance from the port, properly so called.

It is the same all along the coast as far as—

Colberg.—A strong place, besieged in 1807, and attackable (from the sea) at 2,200 mètres. Before entering upon action there, it will be necessary to make a reconnaissance, in order to make certain that the houses along the shore, the Casino in particular, do not mask fortifications which would compel a modification in the plan of attack.

Danzig.—The fort at the entrance to the bay is within range of our upper-deck guns, but only at a distance of 4,000 mètres. The battery guns could not be used elsewhere with advantage.

Conclusion.—Colberg and Danzig alone can be attacked; but the small effect which will result from these two attempts will be of a nature to deprive the French squadron of the prestige of its force. In order to operate usefully special vessels are required, and the prospect of forcing the enemy to assemble his troops on this part of the littoral. But this end is unattainable without a landing force.

This paper, signed by the members of the Committee, was read on the 13th August to all the Captains of the squadron, and did not provoke a single observation, in spite of the prior request of the Vice-Admiral to all his senior Officers to study the question, and to settle, each one for himself, what could be usefully attempted. In a word, the adhesion was general.

It must be remarked that in the report there was no question of Hamburg, or of Lubeck, of Bremen, or of Stettin, nor in fact of any of the ports of which the destruction seemed so easy to the critics who, being on shore, occupied themselves with the affairs of the squadron. It was because these towns (these fantastic sailors did not know it, and no doubt ignored it) are at the ends of shallow rivers, 12 or 15 miles from the coast, where even in peace-time and with the most skilled pilots, the Prussian ironclads do not enter themselves. To ask for their bombardment by the Baltic Squadron would bring us back to the fear that the English line of battle ships would some day shell Rouen or Bordeaux.

There remained, then, Colberg, and Vice-Admiral Bouët prepared to

make some serious demonstration against this town, when he received, on the night of the 13th August, a dispatch which informed him that the Prussian fleet had left the Jade, and had passed up the coast of Jutland to enter the Baltic.

The fact might be true, for it was possible that Prince Adalbert might have learnt the departure of Admiral Fourichon from Cherbourg, and had left the Jade to seek the shelter of Kiel, which he thought might be attacked.

In face of this contingency the Commander-in-Chief of the squadron did not hesitate an instant; he hastily drew his ships together, and proceeded towards the Great Belt to oppose the passage of the enemy's vessels and to offer them battle.

The cruise along the Prussian coast was then interrupted for some days; but the time was not lost, for the Admiral utilized it to proclaim the blockade of the enemy's ports, and a copy of the notification was sent to the French Minister at Copenhagen for insertion in the official Danish newspapers.

However, the Prussian fleet had not left the Jade; it was, on the contrary, closely blockaded by Admiral Fourichon, who had arrived there with seven ironclads, the cruise of which, to be presently returned to, was to be still more unsatisfactory than that of the squadron in the Baltic.

As soon as it was certain that there was nothing to fear from the northern side, Admiral Bouët passed to the southward, and arranged his squadron in two divisions, to endeavour, with the feeble means at his disposal, to make the blockade as effective as possible. On the 16th of August he advised the Minister that Rear-Admiral Dieudonné blockaded from Kiel to Arkona with his division, and that he himself watched the coast from Stettin to Memel.

But it must be observed that, having only heavy ships under his orders, the smaller Prussian vessels could always find refuge along the coasts, and that the blockade would soon have an effect more moral than real, the shore to be guarded being more than 300 miles in length.

It was in the midst of all this that the dispatch vessel "*Jérôme Napoléon*" had an affair with a Prussian dispatch-vessel, the "*Royal Eagle*," which she would have captured if she had only had a bow gun. But the "*Royal Eagle*" is a very fast steamer, and before the "*Hermite*" and the "*Thétis*," sent off in chase, were able to cut her off, she succeeded in taking refuge in the bay to the east of Hiddensee, where two of the enemy's gunboats, anchored on the shoals, protected her retreat.

This chase resulted in the discovery of a perfect nest of gunboats in Witte Bay, where the "*Jeanne d'Arc*" was ordered to remain on watch, and proved once more that, deprived of light ships of high speed, and with small draft of water, the squadron would wear itself out to no purpose. Its Commander-in-Chief telegraphed the fact to Paris with the greater pertinacity as he was informed of the armament at Kiel and Danzig of two more fast dispatch-vessels.

It is now easy, after this explanation, to understand the difficult position of the squadron, which the season was about soon to render more perilous.

Thus, at the date of August 23rd, Admiral Bouët was blockading the five more important ports of the littoral, Kiel and Lubeck, by the Bay of Neustadt, Stettin, Stralsund, and Rugen, and there only remained to cruise at sea two ships, including the "*Surveillante*."

But, during the replenishment of one of the cruisers, a guard was required, for in the roads where she went to take in her coal, at Langeland in the Great Belt, or at Kioje Bay in the Sound, she was often visited by the fast dispatch-vessels of the enemy; the "*Grille*," for instance, which suddenly turned up in the night under the land, fired on the anchored ship, tried to pass torpedoes under her bottom, and fled, so that it was impossible to pursue her.

The fatal consequence of this state of things was the delay in replenishment ; each ship could only go to work when protected by a guarding vessel.

None of these facts were unknown to the Superior Authority, to whom the Vice-Admiral sent letter after letter, but the days passed without any amelioration in the circumstances of the squadron. The Danish pilots themselves were afraid, for the weather was rapidly becoming worse, gales succeeded gales on coasts without lights, without bays completely sheltered, and strewn with reefs and shoals. It was, moreover, likely that Denmark, under pressure from Prussia, aided by our want of military success, would be obliged to restrict still more our means of replenishing the ships, and thus make the campaign impossible. As for prizes, there were none ; most of the large merchant ships had been at an early date converted into Russians or Swedes, and the smaller ones could, after slipping along their coasts, get into neutral waters and proceed free from all pursuit.

Vice-Admiral Bouët explained all this to the Minister of Marine, without bitterness, without complaint, but only in the hope of making him understand better what the squadron could and what it could not do, made up as it was. And he proved the real danger to which it was exposed when thus constituted, by bringing before his eyes the report of the attack, of which he was the object, at Danzig, during the night of the 30th August.

Admiral Bouët determined to examine Danzig Roads closely, pushed in there in spite of the mine-fields which defended it, and he had the daring to anchor there, having, however, taken all the precautions necessary in such a case. Not only were the men at their quarters, but, besides, a steam pinnace continually steamed round the anchorage occupied by the ships. Towards half-past one in the morning, a small gunboat of the enemy approached by hugging the land, but the moment she made for the "Surveillante" she was seen by the steam pinnace, on which she opened fire with grape. The pinnace replied with rifles, and the "Thétis," which had the guard, got under way in three minutes by slipping her cable, and chased the Prussian vessel to the entrance of the harbour of Danzig, where she was able to take refuge without much damage.

For the second time the want of small vessels of high speed allowed an important prize to escape, and one understands the discouragement which at this time seized upon the Officers and ships' companies, who began to cease to hope, as compensation for their efforts and their fatigues, for any of those brilliant and decisive affairs so ardently desired by their patriotism. They received from France only the intelligence of new disasters, and they were fatally condemned to relative inaction which humiliated them, and from which they demanded to be released at all risks, in order to get at the enemy.

SIXTH ARTICLE (November 29th).

While Vice-Admiral Bouët, as we have seen, endeavoured to make the best he possibly could out of the difficult situation which so many diverse circumstances had created in the Baltic, Vice-Admiral Fourichon arrived in the North Sea to undertake a cruise, perhaps still more unsatisfactory.

It is, in point of fact, enough to cast one's eyes over a chart, even the most imperfect, of these waters, to recognize the difficulties which a blockade offered to an ironclad squadron. At the bottom of the sort of funnel in which the French ships had to operate, the Elbe and the Weser debouch, and also the bay of the Jade, which had to be closely watched night and day in all weathers. Along these shores, without shelter, and completely in the hands of the enemy, Admiral Fourichon could not dream of a place to replenish in. The English island of Heligoland, which, moreover, could not offer a refuge in case of accident, was closed to him, and it was entirely in the open sea that

he had to fill up with coal and provisions. If it be added that the gales of wind in these parts blew oftenest from S.W. to N.E., it can easily be understood what sort of a business this cruise was on a coast so constantly beaten by wind and sea that the people who are its masters have not in several centuries succeeded in opening a port of refuge. They have been obliged to content themselves with what Nature has offered them behind the banks at the mouths of their rivers. In a word, it is the most inhospitable shore of all, where a French ironclad during a gale, suffering serious damage to her engines or masts, is bound to perish, body and bones.

It was here Vice-Admiral Fourichon arrived on the 9th August, with the "Magnanime," the "Provence," the "Héroïne," the "Couronne," the "Atalante," the "Invincible," the "Valeureuse," the "Revanche," and four small vessels, the "Decrés," the "Cosmao," the "Château-Renaud," and the "Renard."

Without losing a moment he ran along the coast, learnt that the Prussian squadron was at the bottom of the Jade, and divided his squadron into two divisions, under the orders of Vice-Admirals Devoux and Jauréguiberry. These Officers were to watch, one the mouths of the Elbe, and the other the mouths of the Weser, whilst he himself never took his eyes off the enemy's fleet, to which he over and over again offered battle, but always without result.

Ten or twelve days thus passed in observation, when one morning the whole fleet collected off shore had a moment's hope. A dispatch-vessel ran out of the Bay of Jade, and made for the anchorage. It was soon seen that she bore a flag of truce, and also that of a Rear-Admiral. This was a vessel carrying the Prince of Hesse, who made upon Admiral Fourichon this singular attempt at intimidation which has been related in so many different ways. On the request of the enemy's vessel to communicate, the Commander-in-Chief replied by the order to stop abreast of the "Magnanime," and he sent the Chief of his Staff, Baron Roussin, and one of his Aides-de-camp, M. Arago, to her.

These gentlemen were received on board the Prussian vessel by the Commander, who informed them that the Prince of Hesse, the son of the Admiral commanding in the Jade, wished to have an audience with Vice-Admiral Fourichon. He had to give to him, he said, an important communication (*pli*) from the General Vogel de Falkenstein.

The Prince of Hesse, who was on deck, came over to the French Officers, and after declaring falsely that he did not understand our language, in order to get at what M. Roussin and M. Arago said between themselves, it was resolved to speak English.

Baron Roussin replied to the demand of the Prince of Hesse that he had full powers from the Commander-in-Chief of the squadron. The Prussian envoy insisted on not parting with his dispatches, but on carrying them himself on board the "Magnanime," but the French Officers held firm, refusing energetically permission to the Prince of Hesse to go on board the flag-ship, and a decision was come to to hand to M. Roussin this famous communication of the Prussian General. . . .

But the letter of General Falkenstein was in German, and as the interpreter to the squadron was then on a cruise in the "Héroïne" observing the mouth of the Elbe, M. Roussin demanded that it should be translated into English.

The Commandant of the Prussian vessel set to work on this translation, and during this time the Prince of Hesse told the Chief of the Staff of Admiral Fourichon that General Falkenstein was writing to the Commander of the French Fleet to invite him not to attack private property at sea. The Prince added, as he was certainly ordered to do, that the squadron ought not

to be ignorant of the victories of the Prussian Armies in France, and that it was the interest of its Chief to agree to the demand of General Falkenstein, for a refusal could not but prompt reprisals, and increase the war indemnity. M. Roussin replied proudly that "The blockade and the capture of merchant ships are authorized by the Treaty of 1856, which Prussia had signed."

When the letter of General Falkenstein was written in English, the French Officers took it on board the "Magnanime," and whilst Admiral Fourichon was perusing it, the Prince of Hesse and the Officers accompanying him had the imprudence to profit by their stay in the middle of the squadron to make a plan of the anchorage, and to count the guns of the ships.

This was, on the part of the Prince of Hesse, a gratuitous want of respect for his flag of truce; for the French Fleet changed its position several times a day, and all the ships were not present; but this once more shows that, thanks to the system of espionage invented by M. de Bismarck, military honour is not in Prussia what it is amongst ourselves, and that everything is lawful for the servants of King William.

Admiral Fourichon's reply was not delayed. It was naturally a firm refusal, and an order to the Prussian dispatch-vessel to depart immediately. Her Commander took it for granted, and soon proceeded, but instead of making direct for the Jade, he pretended to have made a mistake in order to be able to pass near those of our ironclads. The Commander-in-Chief of our fleet might well have punished such a shameful proceeding; he preferred to abstain, and it is for history to judge severely the men who have only responded to our loyalty by ruses unworthy of their name.

The days which followed this incident were employed by the squadron in securing the blockade, and in pursuing without cessation the merchant ships which attempted to get into the Elbe and the Weser by night. Not a single one escaped; this was the categorical reply of Admiral Fourichon to the insolent step of the Prince of Hesse.

Soon, unfortunately, the weather became bad, gales succeeded gales, and the replenishment of the ironclads, which could only be done by boats in the open sea, became more difficult. The heavy ships of the fleet continued to struggle vigorously against the elements, but the colliers and store-ships not only failed to arrive with the same regularity, but they often remained knocking about at sea before being able to join the squadron, and the loss of a certain number of them was fatal. Moreover, the season was advancing, the equinoctial hurricanes were imminent, and the French ironclads would soon find themselves without coal in the most critical position.

Admiral Fourichon maintained his station not less bravely until the 12th September; but at this date, in the absence of news from France, and on the point of running short of coal, he decided to return to Cherbourg, where he was rejoined by the yacht "Hirondelle," which had already been several days in search of him.

The Commander of this dispatch-vessel brought him his dispatches, informed him of the collapse of the Imperial Government, the proclamation of the Republic, and his nomination as Minister of Marine.

Leaving then his squadron under the command of the Rear-Admirals until he should be able to send it fresh orders, Admiral Fourichon set out in haste for Paris, after having informed Vice-Admiral Bouët that he had quitted the North Sea, and that it might happen that the Prussian Fleet might take advantage of it to come out of the Jade, and throw itself into the Baltic.

SEVENTH ARTICLE (November 30th).

If we now go back some days to rejoin Vice-Admiral Bouët-Willameuz in the Baltic, we shall find his squadron reinforced by the "Rochambeau" and the

"Armide," but weakened by the departure of the "Océan" and the "Flandre." The too great draught of water of the "Océan" often left her useless, and the "Flandre" had damaged her machinery so much that it could only be repaired in France.

The "Armide" is simply an ironclad, and the "Rochambeau" is the famous American monitor, the ex-"Dunderberg," which France had swept away from Prussia by means of certain millions when she was put up for sale at New York. Of lighter draft than the ironclads, furnished with powerful artillery composed exclusively of guns of 24 and 27 centimètres calibre, throwing projectiles of more than 400 pounds a distance of more than 5 miles, with a mean speed of 13 to 14 knots, the "Rochambeau" was certainly a precious auxiliary; but we have seen that, unfortunately, she arrived too late. If Admiral Bouët had had her under his orders when he presented himself before Colberg, he perhaps could not have resisted the desire to make a serious demonstration against that town.

As I have said above, Colberg is, on the whole coast of Prussia, the single point open to attack, and the Commander-in-Chief of the squadron, to satisfy the impatience of his crews, was decided some day to appear before the town to bombard it; but he found himself face to face with one of those obstacles which it is repugnant to a French Officer to pass by.

Colberg is, at the same time that it is a strong place, a watering place, the Trouville of Northern Germany; and when the "Surveillante" appeared, 2 miles off shore with two other ironclads only—for Admiral Bouët did not wish to employ all the force at his disposal—he saw the parades and the terrace of the Casino thronged with women, children, old men, and invalids; while above the principal buildings in the town floated the Red Cross of the Geneva Convention.

To deal death into the middle of this defenceless crowd was not a business agreeable to the seamen of the squadron; and Admiral Bouët had only to consult the Officers to learn that everyone about him was of his way of thinking, and cared little for the sad sort of glory which would attend such an affair. Some minutes later the "Surveillante" turned her head round, and Admiral Bouët drew off, giving M. de Bismarck a lesson in humanity and true courage, which he only repaid by censure and calumny.

A few days later the Commander-in-Chief of the fleet received a dispatch, which has always been inexplicable, and might well be one of those ruses of which the Chancellor of the Northern Confederation makes such willing use. A telegram reached Admiral Bouët ordering him to bombard the open towns on the Prussian coast, and to act with the greatest energy. However, this dispatch was drawn in such ambiguous terms that the Commander-in-Chief demanded its confirmation. To his surprise the Minister did not reply.

Had Admiral Rigault de Genouilly altered his decision, or was he not the author of the dispatch? To these questions it is impossible to reply decisively. But it is permissible to suppose that, the Prussian armies being then in Lorraine, M. de Bismarck would not have been much put out had the squadron bombarded the coast a little—he knew it would not do much harm—in order to justify the excesses of the soldiers in our defenceless towns.

Whatever it was, we cannot sufficiently praise Vice-Admiral Bouët for not making this mistake, or for not falling into this trap, for it would not have failed to leave upon him and on the whole Navy, already so condemned, the responsibility for the Prussian reprisals.

This defamation, cast by certain newspapers which demanded persistently what the squadron was doing, in place of asking what was possible for it to do, was not long without bearing fruit. On the 26th August, Admiral Bouët received a letter in which the Minister appeared to complain, and to say that his orders were not executed.

What orders? We know the instructions given to the Commander of the squadron, and know also, I hope, the insurmountable difficulties which met him in the face.

Justly indignant to see that the Superior Authority blamed him for the relative inaction to which he was condemned, Vice-Admiral Bouët lost no time in writing to the Minister to put before him all that I have put before my readers; then he concluded by saying:—

“You tell me that the squadron first called that of the North is now to be called the Baltic Squadron. I have placed the matter in an order of the day, making to myself this reflection, that if the rôle of this squadron under its first denomination appeared to me at one time rather like that of the fleet in the Black Sea, it appears to me under its second designation singularly diminished by the defeats of our armies, defeats which have broken our hearts, and of which we suffer the consequences. Is it not to be feared, in fact, that there is reason to think we have been asked to do that which was beyond our power, since the immense means of action formerly arranged have been withheld from us? In other words, M. le Ministre, is not our rôle now as unsatisfactory (*ingrat*) as it appeared to us to be brilliant at the beginning of hostilities?”

It was impossible to answer in a tone more dignified and firm to such unmerited reproaches, or to write more faithfully in a few lines the history of this unhappy campaign so full of promise.

The days that followed the dispatch of this letter passed, for the Admiral, in a struggle against incessant gales of wind, and only on returning to the anchorage of Langeland, on the 5th September, he learnt the catastrophe of Sedan, and the grave events of which Paris was the theatre.

He then sent orders to all his Captains to rendezvous at the entrance to the Great Belt, so as to await the new orders which might be addressed to him, and to be ready to act upon them. It was there that he received orders to continue the blockade, and to make every endeavour to injure the enemy; naturally the thought of bombarding Colberg again occurred to him. The season was advanced, the Casino of this town would be a desert, and nothing any longer forbade this demonstration, which could not be of great importance from the military point of view, but which would at least be an encounter to record.

This determination taken, it was the skies which this time appeared to place themselves on the side of our enemies, for during five days the wind blew in a tempest so violent, that the squadron could not quit the anchorage.

EIGHTH AND LAST ARTICLE (December 1st).

On the 13th (September) finally, the weather improved a little, the whole fleet passed to the southward, and while Rear-Admiral Dieudonné restored the blockade of Kiel, Neustadt, and Lubeck with his division, Vice-Admiral Bouët made his way to the eastward to execute his project against Colberg. Before arriving there, he anchored in sight of Arkona,¹ and every preparation was made on board for the fight of the morrow, when, during the night, the squadron was assailed by a gale of wind from the N.W., so violent that several of the ships might have been lost.

The “Thétis” parted her cables, and the “Rochambeau,” caught by the wind on her iron-bound side, struggled for more than four hours against wind and waves before she was able to get out to sea. The unfortunate monitor, so completely steady when steaming head to sea, was almost in the trough, and

¹ Arkona is about 80 miles from Colberg.—TRANS.

rolled 30 to 34 degrees, which disquieted those who followed her with their eyes without the power of coming to her help. If the least accident had at this moment happened to her engines, she would infallibly have been lost body and bones, for her masts, very insufficient in ordinary times, were completely useless in the dangerous situation in which she found herself.

The engines held on well, happily, and the "Rochambeau" joined the squadron, which steered for Kioje Bay; Colberg once more was saved, for hardly had they reached the anchorage, when Vice-Admiral Bouët was informed that the North Sea Squadron had returned to Cherbourg, that the blockade of the Jade was raised, and that very probably the Prussian Fleet would take advantage of it to pass into the Baltic, with the view of taking him by surprise.

He immediately gave orders to defend the passage of the Great Belt against the enemy, and, to his great astonishment, at the moment when he was about to go himself to Langeland with the "Surveillante," he received, at Copenhagen, orders to bring the whole fleet to Cherbourg, passing by the Jade if his coal permitted it. He was told at the same time that M. Thiers was about to arrive in the "Solferino," and that he was to escort him into Russian waters before returning to France; but this order was countermanded almost immediately by a new dispatch, and Admiral Bouët hastened to fill up with provisions and coal in order to execute the last orders which he had received.

Two days later, in spite of bad weather, the whole fleet repassed the Great Belt without accident, and steered to the northward, while the news of his departure spread at Copenhagen, and caused there the saddest stupor. The Danes had hoped up to the last moment that our reverses would come to a conclusion, and that the Government would decide to send into the Baltic the landing force so desired. But, on the contrary, it was the squadron which disappeared, carrying with it the last hope of those friends so devoted that they asked themselves, on seeing the French flag disappear, if in their turn they would not soon have to answer, under the despotism of Prussia, for the sympathy they had displayed towards us.

Three days later Admiral Bouët was off the Jade, and stayed there all day, offering battle to the Prussian fleet, and endeavouring, but uselessly, to bring them out.

On the 29th, at noon, the "Surveillante" re-entered Cherbourg with the whole of the squadron, of which most of the ironclads had not extinguished their fires for sixty-six days.

The second phase of the campaign in the north and in the Baltic was finished, and the third had commenced some days. The Minister of Marine, in fact, while ordering Vice-Admiral Bouët-Willaumez to leave the Baltic, had given to Vice-Admiral de Gueydon the command of the northern fleet, and while the first of these squadrons presented itself before the Jade and vainly offered battle to the enemy, the second, under shelter at Dunkirk, prepared to proceed in its turn to the Prussian coast.

In spite of the advanced season, the navigation into the enemy's ports could not be left free for a single instant, and as replenishment had become impossible in the open sea, Admiral Fourichon had wisely decided that the station should be worked by two squadrons, which would replace one another in turn in the North Sea, and replenish at Dunkirk. Only, knowing the little shelter offered in the road of this town, and the dangers of its navigation, Admiral Fourichon had authorized the chiefs of the squadron to act according to circumstances, and to return to Cherbourg if they judged it necessary.

Vice-Admiral Bouët, in view of these essentially practical dispositions, had not much time to pass at Cherbourg; and on the 10th October he departed

again to relieve the squadron of Admiral de Gueydon, on the coast of Hanover ; but in making for Dunkirk he fell ill, and was obliged to ask leave to land. Rear-Admiral Penhoët took command in the "Savoie," and from this day forth the two squadrons alternately took their station, so dangerous at this season that on the 19th November—this month—the "Surveillante" returned to Cherbourg, towed by the "Revanche," without her rudder, and after having been forty-eight hours in extreme peril in the North Sea. And yet there are writers who dare to ask what the Navy does ?

It is easy to reply to them. One part of its Officers and seamen face the dangers of the sea to watch the Prussian coast, and to defend our commercial ports ; the other part, faithful to the traditions of the Navy under the First Empire, which, coming to the support of our exhausted armies, distinguished themselves at Bautzen and Leipsic—the other part was already at Strasbourg, and finds itself now at Paris, on the walls and in the forts, in the Army of the North, and in that of the Loire, wherever there is danger ; everywhere in fact where there is work for courage, honour, and devotion to accomplish.



ITALIAN COAST-DEFENCE ORDNANCE.

CHANGES FROM 1885 TO 1888.

(From *Rivista di Artiglieria e Genio*, of December, 1888. Translation by
A. ROBERTS, Esq.)

Information on Studies and Experiments.

Coast Matériel.

THE principal innovations introduced in our coast matériel from 1885 to the present year, 1888, will be found briefly summarized in the present chapter, which, after referring to the more important studies and experiments carried out, and to the modifications and adoptions introduced, gives the actual condition of our coast matériel.

At the end of the chapter will be found a short *résumé* of the studies and experiments in regard to this matériel which are still being pursued.

45, 32, and 24-centimetre Guns, Carriages (17·72, 12·64, and 9·45-inch), and Platforms; 24-cm. (9·45-inch) Howitzer, Carriage, and Platform.—No modifications worth mentioning have been introduced as regards the 45, 32, and 24-cm. guns, carriages, or platforms, nor in the 24-cm. howitzer, either as regards carriage, platform, or other gear; what modifications there were being limited to the removal of such slight defects of construction as were counselled by the long and extensive practical experience gained at the Naval Gunnery Schools.

40-cm. A.R.C. Gun, B.L. (15½-inch Hooped and Rifled B.L. Steel Gun).—The limited power of the 32 and 24-cm. guns against the armour of ships of modern construction led to the purchase from Krupp of four 40-cm. steel guns intended for the defence of the fortress of Spezia.

These guns, which were at first intended to be placed in couples within two revolving turrets, were subsequently disposed of differently.

Two of them will be installed in a revolving iron turret faced with chilled cast-iron plates (Grüson), the mechanism and substructure of which will be furnished by Armstrong.

One of these proof plates satisfies the requisite amount of resistance to the impact of 43-cm. (17-inch) tempered steel projectiles, which strike it with an energy of 48,436 foot-tons.

The other two guns will be placed on two floating pontoons, which are also to be constructed by the Armstrong firm.

The ammunition for these guns consists of tempered steel shot, supplied by Krupp's firm, and of chilled cast-iron shot from the Genoa foundry.

These steel or cast-iron projectiles, when empty, weigh 910 kilog. (2,006 lbs.), and have a bursting charge of 10½ kilog. (23 lbs. 2½ ozs.) of fine powder.

These projectiles will be fired with brown prismatic powder, supplied from the Fossano powder mills; this powder, during repeated trials carried out at the Muggiano practising grounds with the 43-cm. naval gun, has proved itself able to compare advantageously with the best prismatic powders of Düneberg, Cologne, or of Rübeland; the results obtained from a charge of 375 kilog. (826½ lbs.), firing a projectile of 908 kilog. (2,028 lbs.), being equal

to an initial velocity of 565 metres (1,854 feet), with a mean pressure (crushers) of less than 1,900 atmospheres ($12\frac{1}{2}$ tons).

The charge, divided into six cartridges, will be about 340 kilog. ($749\frac{1}{2}$ lbs.), the posterior cartridge in order to facilitate ignition will have its centre made up of grains of black prismatic powder with a hole through the centre.

16-cm. G.R.C. Gun (6-29-inch Hooped and Rifled Iron Gun).—In consequence of the absolute want of power of the 16-cm. G.R.C. gun as a coast gun, it was determined to remove these guns entirely from the armament of fortresses and to utilize them for conversion into 21-cm. B.L. G.R.C. howitzers.

Matériel for 28-cm. (11-inch) Howitzers.—The essential innovations introduced in the matériel for 28-cm. howitzers issued and in construction are two, viz. :—

1. Reduction of the gun-carriage so as to allow fire up to 75° elevation.
2. Abolition of the platform elevating gear and application of the system of disc springs.

The first modification sprang from the adoption of firing with high angles of elevation, of which we shall speak further on. In order to obtain this it was absolutely necessary to cut down the middle transom of the carriage and to raise the horizontal part of the fore transom.

The second modification was rendered desirable on account of the inconveniences experienced in practice from the elevating gear.

With this modification the platform is supported by four cast-iron rollers, which run on the platform rails, two being placed in front and two behind, in framings or casings, which support a guide rod which traverses the side framing, fixed to the platform, containing six disc springs.

The application of the disc springs to the platform has rendered the service of the 28-cm. howitzer much less fatiguing, and has also led to the great advantage of being able to diminish the number of men to serve it.

Disappearing Gun-carriage with Hydro-pneumatic Platform (Armstrong) for 28-cm. Howitzer (11-inch).—Although our gun carriage and platform for the 28-cm. howitzer leaves little to be desired as regards facility in serving or resistance, yet, in consequence of researches made by the Armstrong firm, experiments were made with disappearing carriages fitted with hydro-pneumatic platforms, which allow a vertical angle of fire of from 45° to 75° , and a horizontal all round fire (360°).

These carriages having given satisfactory results after being experimented with, and account being taken of the important advantages resulting from the large horizontal arc of training which they allow, of their comparatively simple method of fixing, and of their taking up less space in battery than the ordinary carriage and platform, they were introduced into the Service (see *Giornale d'Artiglieria e Genio*, A.D. 1888, p. 334) particularly for placing in batteries designed for indirect laying.

The disappearing carriage weighs about 8 quintals ($15\frac{1}{2}$ cwt.), and is formed of two blocks united by a transom, on each of which is a trunnion-hole with a capsquare joined by bolts.

The hydro-pneumatic platform weighs about $9\frac{1}{2}$ quintals (18.7 cwt.), and consists of two brackets (or cheeks) with two polished surfaces, on which the carriage runs.

The brackets rest on a system of girders braced by transoms, and at the back end of the brackets are fixed the cylinders, within which the cylinder-rods work.

On the upper surface of each cylinder is a buffer, formed of several layers of felt and grease, pressed between two discs, through which bolts are passed. The upper disc serves as a brake for the recoil of the carriage.

The platform is supported by fourteen rollers, and has the turning gear

fixed to the left of it ; this gear is worked by a hand-wheel, and allows, when the shaft and pinion which work on the toothed arc fixed on the guide are set in motion, of the whole being revolved.

The elevation of the howitzer is effected by the elevating gear, which is worked by two fly-wheels, one on either side of the platform.

The recoil of the piece is checked, and the automatic recoil in battery effected, by means of the hydro-pneumatic brakes, which consist of two cylinders which are fixed to the brackets ; each cylinder is divided into two chambers. One, by means of its piston, bears the weight of the piece on recoil, whilst the other, which contains glycerine and air, communicates with the first through the recoil valve and the lifting valve. The glycerine and air chamber can be got at directly by a screw tap, which is fitted with a leather ring.

The cylinders communicate with each other by means of three tubes ; the first connects the two recoil presses underneath, the second, which also passes underneath, connects the two elevating presses, and the third, a thinner one, is on top of the elevating presses.

The upper end of the recoil press is fitted with a collar, hermetically closed, and a filling tap is screwed on to the communication tube of the elevating press.

The glycerine and compressed air chambers are filled by the aid of an air pump, which compresses the air to a pressure of about 89 atmospheres (1,308 lbs.).

The platform base (or substructure) consists essentially of a track secured to cramps embedded in a concrete basement. The fourteen rollers which support the platform rest on and travel over this track ; the toothed arcs, by means of which the complete rotation of the system is rendered possible, are fixed within the inner circumference of this track.

The operation of charging the cylinders of the carriages to the required pressure by the air pump only, or of re-establishing the pressure when diminished, whilst firing is going on, by loss, escape of air or glycerine, by the bursting of the communicating tubes between the hydro-pneumatic cylinders, or by deformity of the valve, &c., is long and fatiguing, and requires about three hours for each carriage.

In order, therefore, to obviate such a grave inconvenience, every battery, in addition to tubes and spare valves, is supplied with compressed air cylinders of the Nordenfelt type (one for each piece) by means of which air can be easily introduced into the hydro-pneumatic cylinders of the carriages by simply connecting them together ; an operation which takes from four to five minutes to effect.

The Nordenfelt cylinders are charged either by a steam engine suitable for the purpose where there are many batteries, or, in isolated batteries, by means of a hand-pump, and they are always kept ready charged in the battery so as to be available on every occasion.

Ammunition.

No innovations have been made as regards projectiles, but substantial alterations have been introduced in regard to fuzes and powder.

Fuzes.—In 1885 a percussion fuze was designed for projectiles loaded from the base which was to serve both for 32 and 24-cm. (12·6-inch and 9½-inch) shot as well as for the 28-cm. (11-inch) shell—a small lead tube filled with a mixture (for delay) being used with the latter in order to ensure the bursting of the shell being delayed until penetration had ceased.

This fuze, which had consequently to be used both when firing with heavy charges from guns, *i.e.*, with high initial velocities—and when firing with

reduced charges from howitzers, *i.e.*, with low initial velocities—was of somewhat complicated construction. Nevertheless it was adopted in 1886, under the name of "Percussion fuze for 32 and 24-cm. shot" (*v. Giornale d'Artiglieria e Genio*, A.D. 1886, p. 19).

Subsequently a more simple percussion fuze having been designed for the 15-cm. (6 inch) shot, its use was extended to those for coast defence; a new fuze was thus introduced for siege and coast projectiles (*Spoletta per palla d'assedio e da costa*, 45, 40, 32, 24 and 15-cm.),¹ and the employment of the original fuze for 32 and 24-cm. projectiles (delay) was limited to the 28-cm. shell, and as such took the percussion fuze for 28-cm. shell—*Spoletta a percussione per granata da 28* (*v. Giornale d'Artiglieria e Genio*, A.D. 1887, p. 590, and 1888, p. 123).

Meanwhile a percussion fuze—for shells loaded from the head, of the type M. 1880, but much more sensitive, was designed for use at first in short guns with reduced charges: this fuze, which has a delay tang, is styled Percussion fuze M. 1885 (*Spoletta a percussione*, M. 1885) and was adopted in 1886 for the 21-cm. shell and for the 24-cm. mine shell—*Granata mina* (see *Giornale d'Artiglieria e Genio*, A.D. 1886, p. 1898, and 1887, p. 578).

The increased sensitiveness of this fuze was obtained, 1st, by increasing the weight of the screw plug of the percussion cap carrier by introducing into its head molten and compressed lead; 2nd, by increasing the weight of the pellet. With these modifications the action of the fuze was assured, whether at the moment of discharge, or on graze under the most unfavourable conditions.

Thereupon, in order to simplify the employment of the various fuzes in use, experiments were undertaken to ascertain whether difficulties would not occur in using the fuze M. 1885, with its sensitive priming when firing, and especially when handling loaded 32 and 24-cm. shell.

The experimental trials, however, carried out with the 15-cm. (5-inch) gun, with 20 lbs. charges, proved the possibility of using without danger the fuze (M. 1885) even when firing 32 and 24-cm. guns.

The trials for ascertaining the safety in the handling of the fuze consisted in finding out from what height it was necessary to drop 32 and 24-cm. shells to set the fuze in action. The result of these trials demonstrated the practical safety of fuze M. 1885; but by an excess of prudence it was laid down that the priming of the shell should only be inserted when the shell was actually on the loading plate.

Thereupon the use of this fuze (without safety pin) was extended to the 32 and 24-cm. shells (see *Giornale d'Artiglieria e Genio*, A.D. 1888, p. 413).

Powder for 24-cm. (9½-inch) Guns.—It having been ascertained that large grain powder, N. 2 (cubes), after absorbing moisture loses a good deal of its ballistic power, suitable experiments were made with powder not artificially moistened, but kept for a winter in the powder magazine at the Cirié Camp, and also with powder artificially moistened to 1·5 per cent., and then dried in the sun.

The results obtained when fired from a long 24-cm. gun are shown below (p. 245).

The deduction from these results is that cubical powder after absorbing moisture, even in moderately small quantities, becomes undoubtedly unserviceable for the purpose for which it is destined; for if it is used without drying, its ballistic power is excessively lessened, whilst if it is dried, even in the sun, its quick burning attains absolutely inadmissible proportions, changing the internal structure of the grain and consequently altering the slow combustion character of the powder.

¹ Vide *Giornale d'Artiglieria e Genio*, A.D. 1887, p. 567.

Powder not Artificially Moistened.

Number of rounds.	Weight of projectile.	Charge.	Mean velocity at 50 metres from muzzle.	Mean pressure.		Distance between base of projectile and section at the breech.
				Rodman.	Crushers.	
4	lbs. 322	lbs. 61½	feet. 1346	tons. 12·09	tons. 12·095	inches. 42·244

The initial velocity from firing table is 1,427 feet.

Powder Artificially Moistened to 1·5 per cent., and then Sun Dried.

1	322	61½	1433	21·11 ¹	21·81	42·4
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¹ High pressure.

In consequence of this state of things it was ordered that cubical powder was never to be sun dried (see *Giornale d'Artiglieria e Genio*, A.D. 1885, p. 22, &c.), and that the charge for the 24-cm. guns should be raised to 30 kilog. (66·13 lbs.), so that the additional 2 kilog. should compensate for the diminution in ballistic power of the damp powder; at the same time, however, it was decided gradually to substitute progressive powder for cubical powder.

Experiments having proved that a charge of 68·34 lbs. of progressive powder, No. 2 (the same as employed for the 32-cm. gun), fired from the long and short 24-cm. guns gave initial velocities differing but slightly from those produced by 66·14 lbs. of cubical powder, with internal pressures much lower than the maxima allowed for the said powder, progressive powder was adopted for the 24-cm. guns as well, and suitable bags were prepared accordingly (see *Giornale d'Artiglieria e Genio*, A.D. 1885, pp. 210 and 211).

The substitution of progressive for cubical powder is now completed.

Incendiary Charge for 24-cm. Shell-mines (Granata-mina) and 28-cm. Shells.

—In view of the indifferent results obtained from the carcass composition in cylinders employed in the incendiary charges of shells, suitable experiments were made with various incendiary substances, and for this purpose small incendiary cylinders (*cilindretti incendiari*), similar to the French, were at last adopted and employed for the loading of 24-cm. shell-mines (*granata-mina*) and 28-cm. shells.

Loaded in this manner the 24-cm. shell-mine contains 12·56 lbs. of powder and 94 small cylinders, and the 28-cm. shell 62·83 lbs. of powder and 111 small cylinders.

Gun-cotton Charge for the 28-cm. Shell and for the 24-cm. Shell-mine.—Meanwhile studies and experiments were being indefatigably pursued on explosives of a yet more powerful nature than powder for use in the bursting charges of projectiles. These researches led to the adoption of gun-cotton in grains for the 28-cm. shell and for the 24-cm. shell-mine (see *Giornale d'Artiglieria e Genio*, A.D. 1887, p. 567).

This gun-cotton was obtained in bulk from the firm of Wolff at Walsrode.

The gun-cotton which forms the bursting charge of these shells is moist, *i.e.*, it contains from 18 to 22 per cent. of water, and is dressed into prisms of the following dimensions:—

Minimum .. $12 \times 12 \times 22$ mm. = $0.472 \times 0.472 \times 0.866$ inches.

Maximum .. $14 \times 14 \times 24$ „ = $0.551 \times 0.551 \times 0.945$ „

The 24-cm. shell-mine is loaded with about $16\frac{1}{2}$ lbs. and the 28-cm. shell with about 17.63 lbs. of this kind of wet gun-cotton.

Paraffin mixed with vegetable wax (Carnauba wax) is employed to keep the bursting charge in proper position.

Small cylinders (or pellets) of dry gun-cotton, *i.e.*, containing only from 1 to 2 per cent. of moisture, are employed to cause the explosion of the wet gun-cotton.

The fuze used for the 24-cm. shell-mine is the 1885 pattern, with an appendix screwed to the body intended to receive the head of the fulminating cap.

The appendix is threaded externally, so as to allow the case (an empty steel cylinder), which contains the pellets of dry gun-cotton, to be screwed on to it.

These pellets have a diameter of about 24 mm. (0.95 inch) and a length of about 50 mm. (1.97 inches). They are covered with paraffined paper, and five of them form the loading of the case: the top one is perforated to make room for the cap.

The cap causes the explosion of the dry gun-cotton, which in its turn explodes the wet prismatic cotton; it contains 1 g. ($15\frac{1}{2}$ grains) of fulminate of mercury, covered with a layer of pressed powder, so as to give a slight delay in the explosion of the projectile.

The 28-cm. shell fuze (without delay), fitted with appendix, cap, and case, similar to that used for the 24-cm. shell-mine, is employed for the 28-cm. shell. The pellets have a diameter of 30 mm. (1.14 inch), and three of them form the loading of the case.

Laying and Firing. Range-finders.

The continuous improvements introduced in regard to the horizontal armour of ships made it incumbent to have recourse to high-angle fire, in order to penetrate the deck armour of ships and to inflict damage on their vital parts.

After a long series of experiments, it was decided to adopt with the 28-cm. howitzer vertical fire of from 45° to 62° , experience having shown that when fired with angles in excess of 62° and up to 75° , the accuracy of the fire sensibly diminished, in consequence of the disturbing effect produced by the air on the flight of the projectile.

The firing tables, within penetrating range, are calculated for 14 charges of 11 lbs., $12\frac{1}{2}$ lbs., 13.22 lbs., 14.33 lbs., 15.43 lbs., 17 lbs., $18\frac{1}{2}$ lbs., 20.94 lbs., 23.15 lbs., 26 lbs., and 28.8 lbs. of large grain powder No. 1, and 31.97 lbs., 40.12 lbs., and 44 lbs. of progressive powder No. 1; the first eleven being contained in a cloth bag as reduced charges for the 28-cm. howitzer, and the others in a cloth bag for the 28-cm. howitzer.

The firing tables, both for the 28 and the 24-cm. howitzers, have been calculated for batteries on the sea level: suitable tables being worked out and lithographed for batteries placed at varying height above the sea.

With a view to protecting the gun detachments and matériel in the batteries, numerous experiments were made in the indirect laying of coast howitzers, and a system of indirect laying by means of rails and graphometers was adopted; at the same time, every suitable arrangement was made for signalling from outside to the battery the necessary data for laying and firing the guns. With this system, which certainly has many opponents, although

¹ This diameter is liable to alteration in consequence of experiments which are now being made.

the laying and firing of coast howitzers is somewhat complicated, the advantageous employment of disappearing carriages and hydro-pneumatic platforms is rendered possible; and it is also possible to have even low-placed coast batteries under good conditions, both as regards service of personnel and matériel, as well as resistance to the enemy's fire.

The proposals of Captain Braccialini as to the introduction of certain modifications in the Amici vertical base range-finder having been accepted, the alteration of these into vertical base range-finders, 1886 pattern (Braccialini), was quickly taken in hand (see *Giornale d'Artiglieria e Genio*, A.D. 1886, p. 437).

The effect of these modifications has been to make the range-finder more accurate, and also to simplify its employment. By the first half of 1889 all the Amici telemeters will have been altered.

A series of comparative trials between horizontal base range-finders designed by Captain Braccialini and those of Madsen and Goarault of Trommelin having been carried out, the coast range-finder with horizontal base, 1886 pattern (Braccialini), was adopted (see *Giornale d'Artiglieria e Genio*, A.D. 1888, p. 17), and the low-lying coast batteries are already provided with them.

On the proposal of Major Sollier, R.A., and Captain Braccialini, R.A., experiments were made at Spezia with "telegoniometers" to direct fire from stations outside the batteries, and to concentrate the fire of several batteries on the same object.

This important problem was satisfactorily solved, and "telegoniometers" with direct sighting (*telegoniometri a visione diretta*) were adopted (see *Giornale d'Artiglieria e Genio*, A.D. 1888, p. 281) as subsidiaries to the battery range-finders; and telegonomic stations, bearing on the same point on the water, were established for directing the fire from groups of batteries.

Another invention, of no great importance, but very useful in practice for training the troops in serving the coast batteries, is the adoption of reduced coast fire (*tiro ridotto*), evidently on the Morris tube principle.

The reduced fire from 24 and 32-cm. guns and from 28-cm. howitzers is carried out by introducing a small 7-cm. (2 $\frac{3}{4}$ -inch) cannon into the bore of the gun and firing from it a 2 $\frac{3}{4}$ -inch unringed shell loaded with sand.

For guns, the cartridge used contains 1·87 lbs. of large grain No. 1 powder, and the gun is laid as if for ordinary firing, except that suitable volutes have to be used for the automatic tangent sights, and range tables specially drawn up for this method of firing.

For the 28-cm. howitzer seven charges were used, viz.: 5·29 ozs., 6 ozs., 7·05 ozs., 7·94 ozs., 8·82 ozs., 9·7 ozs., and 11·46 ozs. of fine grain powder No. 2; and for the 24-cm. howitzer five, viz.: 5·29 ozs., 6 ozs., 7·05 ozs., 8·82 ozs., and 11·46 ozs. of the same kind of powder.

The firing tables are worked out for the several batteries from 1,500 to 3,700 metres for the 28-cm. howitzer, and from 1,400 to 3,800 metres for the 24-cm. howitzer.

It results, therefore, from what we have said, that at the end of 1888 our coast matériel consists of—

- 45-cm. G.R.C.¹ B.L. guns.
- 40-cm. A.R.C.² B.L. guns.
- 32-cm. G.R.C. B.L. guns.
- 24-cm. G.R.C. B.L. guns, long and short.
- 28-cm. G.R.C. B.L. howitzers.
- 24-cm. G.R.C. B.L. howitzers.

The principal data in connection with this matériel are reproduced in the following tables A, B, C.

¹ G.R.C. = hooped and rifled cast-iron gun.

² A.R.C. = hooped and rifled steel gun.

Table A.

Gun.	45-cm. G.R.C. B.L. gun.	45-cm. G.R.C. B.L. gun.	32-cm. G.R.C. B.L. gun.	28-cm. G.R.C. B.L. howitzer.	Long 24-cm. G.R.C. B.L. gun.	Short 24-cm. G.R.C. B.L. gun.	24-cm. G.R.C. B.L. converted howitzer.
Calibre	17.72	15.75	12.64	11.02	9.45	9.45	9.45
Furnace charge	72.83	..	35.43	11.81	18.01	16.73	5.91 ¹
Weight of casting	66.38	..	31.49	10.12	15.67	13.79	5.07 ¹
Weight of gun { body	47.19	..	21.3	6.01	11.11	9.14	2.72 ¹
hoops	50.63	..	15.75	4.35	6.1	5.8	1.47
breach-piece	19.68 ²	..	7.32	4.29	3.6	3.6	3.25
swinging tray	lbs. 441	..	412.26 ³	22.6 ²	63.93 ²	63.93 ²	61.73 ²
total	tons. 99.11	119	37.6	10.62	17.42	15.16	4.49
Preponderance (breach closed)	cwts. 74.8	7	17.32	44 lbs.	Nil.	Nil.	-55 to +55 lbs.
Cost { materials {	£ 4,248	..	1,040	276	360	360	24 ³
labour	1,044	..	420	204	280	246.8	48 ³
total	2,000	..	300	200	240	240	72 ³
Cost per kilogram of gun	francs 7.292	36,800 ³	1,760	680	880	846.8	1.95
number of grooves	64	92	48	64	24	24	56
twist in feet	feet 88.58	65.61 ⁵	76.28	32.15	{ 49.21 ₄	{ 49.21 ₄	{ 24.10
Rifling from right to left {	inches 2° 59' 10"	32.8"	2° 59' 50"	5° 7' 50"	{ 50.37	{ 50.37	{ 5° 53' 50"
inclination of grooves ... degrees	0.574	..	0.51	0.39	2° 52' 40"	2° 52' 40"	0.37
width	inches 0.008	0.078	0.12	0.07	0.82 to 0.63	0.82 to 0.68	0.07
depth .....	..	..	..	..	0.06	0.06	..
Distance between base of projectile and section at breach .....	..	92.9	69	28	41.5	41.5	20.5
Space allowance in the distance of the projectile {	francs 88.3	..	+0.23	+0.19	+0.19	+0.19	+0.19
from section at breach	{ -0.31	..	-0.23	-0.19	-0.19	-0.19	-0.19

Table A—continued.

Gun.	45-cm. G.R.C. B.L. gun.	45-cm. G.R.C. B.L. gun.	32-cm. G.R.C. B.L. gun.	28-cm. G.R.C. B.L. howitzer.	Long 24-cm. G.R.C. B.L. gun.	Short 24-cm. G.R.C. B.L. gun.	24-cm. G.R.C. B.L. converted howitzer.
Capacity of powder chamber	17,454	23,434	7,128	1,511	1,977	1,977	549
Breech system.....	screw steel expansion ring	wedge	Sc.S.E.R.	Sc.S.E.R.	Sc.S.E.R.	Sc.S.E.R.	Sc.S.E.R.
Length {							
bore, exclusive of socket for expanding gas	370	500 ⁹	252	100	208	167	85.5
check ring	370	500 ⁹	19.9	9	22	17.6	9
bore in calibres	20.9	..	49.7	14.5	39.4	39.4	6.7
powder chamber, not including the cone, .. inches	64.17	73.8	270	112.7	222.7	181.9	9.9
total from muzzle to breech	333.7	551.2	21.4	10.2	23.5	19.2	10.47
total in calibres	22.2	35	2	2	2	2	1
Number of layers of hoops	3	3 ¹⁰	2	2	2	2	1
Thickness of breech coil	13.82	..	7.28	5.12	5.12	5.12	2.53
Total thickness of walls at breech	27.4	23.8	18.7	13.58	14.56	14.56	8.48

- ¹ For a 22-cm. M.L. howitzer.
- ² With small obturating ring.
- ³ Cost of conversion. The total cost of the converted howitzer is 348/.
- ⁴ For the restricting and directing aides.
- ⁵ At breech.
- ⁶ At muzzle. The final twist is constant for a length of 26 inches from the muzzle.
- ⁷ Has no preponderance, as it has no trunnions.
- ⁸ Exclusive of custom-house dues, but including cost of transport.
- ⁹ Length measured from front face of wedge.
- ¹⁰ Only the layers over the breech lining are counted: the A-tube is also hooped as far as the muzzle.

Table B—continued.

Ammunition and firing data.	45-cm. G.R.C. B.L. gun.	45-cm. G.R.C. B.L. gun.	32-cm. G.R.C. B.L. gun.	28-cm. G.R.C. B.L. howitzer.	Long 24-cm. G.R.C. B.L. gun.	Short 24-cm. G.R.C. B.L. gun.	24-cm. G.R.C. B.L. converted howitzer.
Density of charge	0.77	0.85	0.73	0.807 for charges > 32 lbs. 466 to 1,030	0.925	0.925	0.59 for charge > 456 to 758
Initial velocity { Shell..... feet Shot..... "	1,480	1,804	1,623 1,467	..	1,542 1,427	1,476 1,378	
Velocity { at 1,000 metres and 2,000 "	..	..	1,398 1,230	..	1,316 1,148	1,276 1,145	
metres { Shot at 1,000 "	1,885	..	1,316	..	1,256	1,230	
(1,094 "	1,256	1,575	1,200	..	1,152	1,132	
and 2,187 "		at 2,500 m.					
yards) }							
Total energy { Shell..... ft. tons at muzzle { Shot..... "	..	..	10,736 11,414	..	4,575 4,682	4,194 4,366	
Total initial energy per cm. of circumference of shot..... "	32,839	46,136	115	..	62	59	
Energy { Shell at 1,000 m. " 2,000 m.	232	367	8,037 6,239	..	6,261 2,331	3,155 2,541	
at 1,000 "	..	..	9,186	..	3,629	3,481	
and 2,000 { Shot at 1,000 m. metres " 2,000 m.	28,751 25,190	35,325 at 2,500 m.	7,633	..	3,051	2,948	
Energy per cm. { of circumference { at 1,000 m. " 2,000 m. of shot	203.5 178	.. 263 distance not stated	92 76.6	.. ..	49 41	47 40	
Maximum range of shell fire.... yds.	..	..	8,749	8,858	9,843	9,843	5,140

Table B—continued.

Ammunition and firing data.	45-cm. G.R.C. B.L. gun.	45-cm. G.R.C. B.L. gun.	32-cm. G.R.C. B.L. gun.	28-cm. G.R.C. B.L. howitzer.	Long 24-cm. G.R.C. B.L. gun.	Short 24-cm. G.R.C. B.L. gun.	24-cm. G.R.C. B.L. converted howitzer.
	8,749 2,187 .. 21.26	10,390 ¹ 10,390 ¹ (sic) .. 16.93 at 2,600 m. (2,734 yds.)	8,749 2,187 .. 13.78	9,843 2,187 9.45	9,843 2,187 9.45	
Maximum range { Pounding yds. for shot { Perforating... "							
Thickness of { at 1,000 metres iron plating { (1,094 yds.) pierced by { at 1,500 metres shot { (1,640 yds.)							

¹ Allowed by gun-carriage.

Table C.

Carriages.	45-cm. G.R.C. B.L. gun.	40-cm. G.R.C. B.L. gun.	32-cm. G.R.C. B.L. gun.	28-cm. G.R.C. B.L. howitzer.	Long 24-cm. G.R.C. B.L. gun.	Short 24-cm. G.R.C. B.L. gun.	Converted 24-cm. G.R.C. B.L. howitzer.
	Defensive barbette with box sides. Centre pivot platform and three cylin- ders.	Armstrong's hydraulic system for revolving turret.	Defensive barbette. No. 7 front pivoting plat- form, two cylinder brakes.	Defensive, with box sides, No. 13 central pivot platform, brake cylinder only.	Defensive barbette, front pivoting platform, with one cylinder only. High ¹ Plat- form No. 1.	Defensive barbette, front pivoting platform, brake cylinder only. Low ¹ Plat- form No. 5.	Defensive, Platform No. 12 front pivoting, two box-compre- sor friction brakes, one breaching. 70
Height of axis of piece inches	135.8	..	126	74.6	109.5	96.8	+ 41.5-10°
Genouillere..... "	102.4	..	102.4	..	90.5	78.75	18.89
Vertical arc of fire degrees	+ 20-6°	+ 13-5°	+ 30-6°	+ 75-5°	+ 32-8°	+ 20-15°	2.795
Weight of gun carriage cwt.	322.8	..	100.24	101.37	54.13	55.11	Metal, con- verted from the masonry and granite platform of 22-cm. gun.
Weight of platform.... tons	29.084	..	14.861	8.021	6.186	5.0	
Platform base	Metal on square with granite bot- tom.	..	Metal with two tracks on granite.	Metal and wood for up- per part of circumfer- ence, lower parts in gra- nite.	Metal with masonry and sector.		
Cost of carriage and platform	2,392 ¹ .	4,000 ^{1,2} .	1,744 ¹ .	958.8 ¹ .	620 ¹ .	416 ¹ .	176 ¹ .
See articles in <i>Giornale</i>	1876, p. 3.	<i>Rivista</i> , April,	1877, p. 23.	1882, p. 876.	1884, p. 103.		1883, p. 211.
<i>d'Artiglieria e Genio</i> ,	1880, pp. 745	1886.	1881, pp. 946	1883, p. 284.	1876, p. 337.		1884, p. 292,
part 2, and in <i>Rivista</i>	and 1073.		and 1194.	1884, p. 292,	1876, p. 335.		vol. 4.
<i>d'Artiglieria e Genio</i> .	1881, p. 913.		1884, p. 292,	vol. 4.	1884, p. 292,		
	vol. 4.				of vol. 4.		

¹ The long 24-cm. gun can exceptionally be mounted on the low carriage with platform No. 5, and the short 24-cm. gun on the high carriage with platform No. 1, but the platforms are not interchangeable.

² Cost of buying the carriage alone without gear.

The following gives a *resume* of the chief studies and experiments actually being made on the subject of our coast matériel.

Tubing of Coast Guns.—The duration of service of the 24-cm. and 32-cm. cast-iron guns is somewhat limited in consequence of the rapid corrosion in the powder chambers and at the commencement of the rifling produced by the heavy charges of slow burning powder: the consequent advance of the projectile in the bore thus modifying the conditions of discharge.

Long experience with a 9-cm. B.L. Parsons gun of manganese-bronze having shown the great resistance which this metal offers to the corrosive action of the powder gases, trials are now being made to reline with it a 32-cm. gun rendered unserviceable through corrosion.

The retubing will be limited to the portion of the bore which corresponds to the double hooping of the gun. After suitably enlarging the portion of the bore which is to be replaced by the tube, the tube will be introduced and lightly forced into the gun and will then be compressed with a steel, or very hard iron mandrel, in the same manner as is done with bronze guns.

If these experiments should prove as successful as is anticipated a sufficiently economical method will have been found for prolonging the service of coast guns, and one which can be applied as well to the coast howitzers and 15-cm. G.R.C. B.L. guns.

24-cm. and 28-cm. Steel Torpedo-shells.—In order to be able to throw larger quantities of powerful explosives, trials are being made, for use with the 24-cm. and 28-cm. howitzers, of steel shell which have a large internal capacity. These are called torpedo-shells (*granate-torpedini*).

The 24-cm. torpedo-shell consists of a cylindrical steel jacket with removable cast-iron ogival head: in this jacket is inserted a zinc casing which contains the gun-cotton or other powerful explosive. The fuze, which is similar to the one already described, has a body, however, of larger diameter than the 1885 pattern with pellet and priming of the 1885 pattern; to the body is attached the appendix for the fulminating cap and to the appendix the case which contains the pellets of dry gun-cotton.

Two types of 28-cm. torpedo-shells are being experimented with; one of which has the filling hole in the head and the other at the base.

The shell with loading hole in the head consists of a steel cylindrical casing with movable ogival head, also of steel, fitted with a fuze similar to the 24-cm. torpedo shell. The wet gun-cotton in discs, to the weight of about 44 lbs., or other explosive, is introduced directly into the casing.

The other torpedo-shell, filled from the base, has a chilled head with screw base, and carries a fuze similar to the one employed for the cast-iron shell, loaded with granular gun-cotton, or another kind of fuze which is being experimented with; the gun-cotton in discs, over 44 lbs. in weight, or other explosive, is introduced directly into the casing.

Both these torpedo-shells, in weight and length, about equal the ordinary cast-iron shell.

Shrapnel Shell for Coast Artillery.

In order to defend the lines of torpedo mines from being fished for by boats, and to act against landing boats, it was decided to try the effect of shrapnel shell from coast artillery; the experiments for the present being limited to calibres of 32-cm. (12·6-inch).

After trying a few types the trials are now being continued with a shrapnel having a steel casing, iron diaphragm, and base filling.

The casing has a movable ogival head, and the iron shot, which have a diameter of 1·89 inches, are arranged in layers which are kept in position by perforated discs. The projectile weighs about 593 lbs., and the experiments, so far as they have gone have given excellent results.

THE TRAINING OF THE GERMAN RECRUIT.¹

(Translated by the kind permission of the Author by Lieut. G. F. ELLISON,
2nd Batt. L.N. Lancashire Regiment.)

Introductory Remarks.

For the benefit of those readers of this Journal who have had no opportunity of personally studying the German Army, a few words regarding the system of training the recruit, which obtains in it, may not seem out of place as an introduction to the "Weekly Tables of Work," which Captain von Busse has kindly allowed to be translated.

Like everything else in the German battalion, the recruit's training is mainly influenced by one great principle, viz., the personal responsibility of the Company Commander. The German Captain has his raw recruits handed over to him in the first week in November, and he has to bring them up to a certain standard of efficiency, and that a high one, in rather over twelve weeks, as at the end of that time the Commander of the three battalions, which form a German regiment, will inspect in a most searching manner the recruits of each company, and every Officer knows full well that to a large extent his chances of promotion depend upon the way in which his men then acquit themselves. As regards the method of training, the Captain is practically unfettered by regulations, and no one has a right to interfere with what he thinks fit to do, unless such action is directly contrary to the spirit of existing regulations or manifestly would give but insufficient results. Some officers have their own systems of training their men, while, on the other hand, others are glad to borrow ideas from such works as that by Captain von Busse.

The actual method of working out in practice whatever system of training is considered best, is to all intents and purposes universal. The normal peace strength of a German company is 1 Captain, 2 or 3 subalterns, 14 non-commissioned officers, 13 lance-corporals, and 117 or 118 privates. The Captain knows that each year in November he will receive some forty-eight recruits, for whose training he will be responsible. As soon, therefore, as the autumn manoeuvres are over in September, he sets to work to get his training staff in readiness. He tells off one of his subalterns as the Officer who will be in charge of the recruits. After the arrival of the recruits this Officer's sole duty will be to superintend their training and instruction and to see that everything is carried out in accordance with the Captain's wishes. To assist him in his work he will have a staff of 4 non-commissioned officers² and 8

¹ Die Ausbildung der Rekruten der Infanterie in Wochenzetteln unter Berücksichtigung des neuen Exerzier-Reglements, sowie der neuesten Verordnungen und Vorschriften aus der Praxis zum Gebrauch für Offiziere und Unter-Offiziere, bearbeitet von Von Busse, Hauptmann und Kompagnie-Chef im Grenadier-Regiment König Friedrich Wilhelm II. (Pommersches) No. 2. Zweite Auflage. Berlin, 1888. Verlag von A. Bath. Pamp., pp. 46. Price 6d.

² Non-commissioned officers in the German Army are almost without exception men with less than twelve years' service, as after that time they have a claim on some post under Government, of which the great majority avail themselves. German regimental Officers state that want of experience on the part of their non-commissioned officers increases the difficulty of training their men to an enormous extent.

lance-corporals, with the addition of 1 non-commissioned officer and perhaps 1 lance-corporal as assistant, who will pay especial attention to musketry. On the recruits joining the company they are at once told off into four *Korporalschaften* or squads, each of twelve men, under a non-commissioned officer, with two lance-corporals to assist him not only in the training but also in maintaining discipline in the squad, which as far as possible is kept together in one barrack room. Of the two lance-corporals, one should be a good gymnast, as he will be specially told off to instruct the recruits in gymnastic exercises.¹ During the next three months then the entire attention of this training staff will be devoted to training the recruits on lines similar to those proposed by Captain von Busse in his "Weekly Tables."

It is hoped that in the translation the technicalities of the actual training have been made comprehensible to the English reader. There is, however, one matter, peculiar to the German Army, which is considered of such importance in the training of recruits that it can hardly be passed over in silence. This is the "*Einzelausbildung*," or training of the individual. The German Drill-book, published in September last, in its 1st section lays down: "The foundation of the soldier's entire training . . . is the careful and strict instruction of the individual. Only by the most thorough instruction of the individual can the requisite combined action of numbers be attained. The faulty and incomplete instruction of a recruit, as a rule, affects him prejudicially during his entire service in the performance of his duties. Faults which are allowed to creep in during the initial stages of the instruction are rarely completely eradicated. It is likewise impossible to remedy defective training of the individual by combined practices." In Captain von Busse's book the reader will see what this training of the individual means, viz., that no work is performed by the squad as a whole, either in marching, physical training, the manual exercise, position drill, &c., or indeed in any part of the recruit's course, before each individual has attained a certain standard of proficiency in that particular subject. To this system of individual instruction must be attributed that uniformity of training and military education in the German Army, which is one of its most striking points. Any one who has ever seen German recruits at work will know well what the individual training is in practice. One of the most common sights, for instance, on a German drill-ground is a small squad passing the instructor in single file in ordinary quick time, or with that peculiar high-kicking action which is known as the "*marching-past step*," a distance of some ten or fifteen paces being maintained between individuals. The instructor closely scrutinizes each recruit as he passes, and should he notice any error, no matter how small, in his position, &c., the luckless offender is sent back at the double to the rear of the squad, to subsequently again tempt fortune, possibly with no better result.

One or two terms which occur in Captain von Busse's book call for some slight explanation. One of these is the practice called "*Rallying*." The object of this is, as may be supposed, to make the recruit handy in rapidly falling in in any ordered formation. It is carried out at no fixed period in the day's work, but if the recruits have been standing for a long time, or the day is cold, the order is suddenly given, either by the Officer to the four

¹ It is very seldom the case that a German battalion has a regular gymnasium at its disposal. In one corner of the drill-ground are erected a few simple gymnastic appliances, e.g., horizontal bars and beams, ropes, ladders, &c. Means are also given for practising applied gymnastics, e.g., a hoarding ten or twelve feet high for ascending, a broad deep ditch, which has to be crossed in heavy marching order, a shallow ditch about twelve feet wide, for broad jumping, &c., &c.

squads of his company or by the non-commissioned officer to his own squad, to fall in at some named spot in a given formation, facing in any direction.

Another rather vague term which implies a great deal is "the independent use of the rifle," so often referred to. This is equivalent to the "Gefechts-missiges Einzelschiessen," or the use of his rifle by the soldier when acting entirely on his own responsibility in the fight, all control of the firing by his superiors having become impossible. In order to create in the men the requisite self-reliance, when thus firing uncontrolled, and to prevent them wasting their ammunition under such circumstances, in other words, to get a proper "fire discipline," the Germans consider that a very advanced knowledge of the theory of musketry is essential for each individual soldier. As evidence of what this knowledge is, the present writer can adduce his own experience, he having on one occasion been present when a squad of young German soldiers was being asked most intricate but practical questions on the trajectory of their rifle, the men giving their answers with a readiness which was indeed marvellous. The German infantry recruit spends about five hours each day in practical work, either on the drill-ground or in the neighbouring country, viz., three hours in the morning and two hours in the afternoon, a break of about two hours, from midday to 2 P.M., being allowed. Besides this he has one hour's theoretical instruction daily, given either by the Officer or the non-commissioned officer of the squad, with a lesson in cleaning and mending his kit, &c., in the evening.

It is only necessary, in conclusion, to add that the infantry recruit, from the very commencement of his course of training, carries his pack, which at first is only lightly loaded, being, however, gradually increased to the full weight which he would have to carry on service. With this weight on his back the recruit will, before the inspection referred to above, have to march on three consecutive days, 15, 20, and 25 kilometres (about 9½, 12½, 15½ miles).

After the inspection his training and instruction is continued without intermission in the "zug,"¹ company, &c. He has, however, then ceased to be a recruit, for the Germans hope that, in consequence of the great simplification of their drill, &c., due to the new Drill Regulations, they will now be able to convert in the course of twelve weeks a raw material, which under a system of universal conscription is, and must necessarily be, inferior to that of a voluntarily enlisted army, into soldiers fit, if need be, to at once take their place on service in the ranks of one of the most highly trained armies which the world has ever seen.—G. F. E.

The Training of Recruits in the Infantry in Weekly Tables, with reference to the new Drill Book as well as the most recent Orders and Regulations, for the use of Officers and non-commissioned officers. Worked out for practical experience by von Busse, Captain and Company Commander.

Preface to the 2nd Edition.

The new Infantry Drill Book has appeared, and been taken into use. Much that was old is gone, and has given place to new measures adapted to the increased demands of the present day. "Besides completely maintaining the discipline hitherto in force," so runs an Army Order of September 1st, 1888, "the Drill Book is intended to give wider scope in training for the exigencies of the fight." For this reason, it is perhaps necessary that the training of the young soldier should be in character essentially different to that of the

¹ A zug is the 3rd part of a company. The zug is divided into sections, each of from 4—6 files.—TR.

past—it will become considerably more concentrated on the actual objects of the fight, on that end for which the soldier exists, namely, War—the individuality of each single soldier will take its place more prominently in the foreground.

The task of those to whom the training is intrusted increases, however, in proportion as more is expected of the individual soldier. They have to work on a material differing in its quality to no considerable extent from that of former days, when what was expected of it was substantially less.

The new Infantry Drill Book, taken in conjunction with the other recent Regulations, demands in a still higher degree than hitherto not only increased and well-regulated energy on the part of the training staff, but also a most thorough control of the system of training, as it progresses, on the part of the immediate superiors. A proper distribution of time and daily tasks is accordingly one of the foremost problems for those on whom the responsibility falls, and the chief factor in the attainment of the object in view.

I have been induced to publish a new edition of these weekly tables of work, partly owing to the above-mentioned circumstance as well as to the consideration that it cannot be otherwise than advantageous for the training staff to have at its disposal a definite plan on which the young Officer and non-commissioned officer can confidently continue to work, without having to make experiments for themselves—experiments which are doubtful, and not always accompanied by success—and partly, too, in consequence of the favourable reception which my work met with last year.

I, therefore, hand over to my brother Officers these weekly tables, at the same time pointing out that they by no means aim at undermining the individual independence of those who alone are responsible for the recruit's training, but that they are only intended to point out one of the many roads which lead to success. I am quite ready to admit that there may be other ways quite as good as the one which I have proposed.

(Signed) VON BUSSE.

The First Four Days after the Recruit joins the Company.

- 1st day.—1. Telling off the recruits into squads.
2. Hair-cutting commenced and completed as far as possible.
3. Bathing and medical inspection.
4. Fitting uniform—fatigue dress and drill order—also one pair of boots.
5. Measuring (measurement tables must be prepared beforehand).
6. Recruits made acquainted with the position of the company quarters, the cook-house, and company store-room.
- 2nd day (morning).—1. Issuing of drill order uniform continued, if not finished on 1st day.
2. Fitting on the uniform which will be worn at the ceremony of taking the oath.
3. Articles of War to be read to the men, and explained by the Company Commander. Forms to be observed in taking the oath.
4. Bathing and medical inspection continued.
- Afternoon.—1. Roll-call in drill order.
2. Fitting on uniform to be worn at oath-taking continued.
3. Recruit's surplus money to be received and entered by Company Commander in the deposit account.
4. Colour-sergeant makes a list showing recruit's antecedents, his civil status.
5. Requirements for cleaning kit laid down.
6. One hour's instruction by the non-commissioned officers in the first principles of order and tidiness in barracks.

3rd day (morning).—1. Fitting clothing continued if not completed, issue of second pair of boots and necessities not yet served out.

2. One hour's instruction by the non-commissioned officers, as on previous day; two hours' drill with special reference to the march through the town to take the oath.

Afternoon.—1. Roll-call in uniform worn at oath-taking (uncleaned), afterwards the same to be cleaned under the superintendence of trained soldiers.

2. One hour's instruction by the Officer on the nature of the oath and forms to be observed in taking it.

4th day.—1. Regular duty; subsequently taking the oath.¹

2. Weighing recruits.

3. Giving in all articles of civilian dress, &c. These are placed in a bag, which is sewn up and the man's name placed on it.

WEEKLY TABLES OF TRAINING AND INSTRUCTION.

1st Week.

Dress.—Fatigue dress. On the 4th day the recruits bring their rifles with them when they fall in.

Physical Training.—1st, 2nd, and 3rd groups of exercises² individually each day, as well as various exercises calculated to strengthen all parts of the legs, and make them supple. These consist in raising the leg off the ground and working the ankle and knee-joints, and swinging the leg backwards and forwards.

Physical Training with the Rifle.—Nil.

Rallying.—Falling in in one rank with one pace interval on a named man, an odd or even number, or according to the letters of the alphabet, &c. Principles of dressing and covering must at the same time be taught.

¹ The swearing-in of the recruits in the German Army made a most imposing ceremony, which takes place usually in the church. There is first of all a short service, with suitable address by the Chaplain; the Articles of War are read out to the men, and then each one takes the oath on the colour of his battalion, which represents the person of the Sovereign. In the cavalry recruits take the oath on the regimental standard, in the artillery on a gun. The oath for Prussian subjects runs as follows: "I, A. B., swear by God, Almighty, All-knowing, this oath that I will truly and honestly serve His Majesty, the German Emperor and King of Prussia, my gracious Sovereign, under all circumstances by sea or land, and in any other place whatsoever, that I will advance his interests and welfare, that I will ward off from him all hurt and injury, that I will carry out in the spirit and to the letter the Articles of War which have been read to me, and that I will obey the commands and orders which shall be given me, and further that I will conduct myself as it behoves an upright and fearless soldier, who loves honour and duty. So may God grant me salvation through Jesus Christ." The concluding formula naturally varies a little for Roman Catholics and Jews.

Regarding this oath, the words of the present head of the German General Staff, the Graf von Waldersee, in his work for soldiers, will well bear quoting. "Henceforth," he writes, "the colour is the most sacred possession of each honour-loving soldier; its honour is his honour."

The 2nd Article of War also lays down: "Inviolable perseverance in loyalty, as promised in his oath on the colour, is the soldier's first duty. Next in order the soldier's calling demands: fitness for war, courage in every demand which his duty makes on him, and bravery on service, obedience to his superiors, honourable conduct both in the service and out of it, and treating his comrades in a good and upright spirit."—Ta.

² This refers to a similar work, which groups the various physical exercises laid down in the German Regulations for Physical Training and Gymnastics.

Saluting.—Passing the instructor individually in a smart natural way without turning the head. Saluting by bringing the right hand to the forage cap.¹

Drill.—Position of the soldier, quick step, changing step. Turnings. Dressing back individually in two motions, keeping the hips braced up. Principles of dressing and covering. Stress to be laid on the importance of remaining motionless in the ranks. Squads, always at open interval, marching in and out of step.² Piling arms.

Manual Exercise.—Nil.

Aiming.—(It is recommended that from the first day onwards the recruits should be practised in aiming by the non-commissioned officer specially told off in the company to look after musketry. This non-commissioned officer's duty must, however, be regarded as only accessory to that of the non-commissioned officer of the squad.)

Explanation of the different kinds of targets. Employment of the sights. Principles of aiming, explanations of the line of sight, line of fire, trajectory being, however, at first quite omitted.

The non-commissioned officer aims a rifle, which rests firmly on a tripod, at a point on a target 20 mètres distant, and makes the recruit say where he has aimed.

The lance-corporal of the squad practises the recruits in closing the left eye, and also in various exercises calculated to make the wrist and hands supple, and to extend the grip of the right hand. (The German soldier is taught to grasp his rifle as firmly with his right hand as with his left.—Tr.)

Position Exercises.—Position drill without the rifle in three motions. The lance-corporal practises the recruits in various exercises with a dummy rifle. (This is used much as clubs are, with the object of strengthening the wrist and arm generally.—Tr.) Further, the recruit will be shown the simple motions of loading, in learning which he will have to assume the so-called "sportsman's position," i.e., no attention is paid to his position being not according to regulation.

Gymnastics.—Nil.

Bayonet v. Bayonet.—Nil.

Theoretical Instruction.—For the first three weeks.

(a.) By the Officer. Articles of War—every recruit must know by heart Articles 2 and 43;³ the oath; universal military service, this to be closely connected with the history of the regiment and of the German nation;

¹ German soldiers always salute with the right hand.

² In Germany, in order to avoid fatiguing the men as far as possible when on broken ground, one very frequently hears the word of command "Ohne Tritt" (out of step), "Marsch," given, and this even at regimental and brigade drills and at manoeuvres, when a company column (the invariable formation for movement) has to take up a new position. The men then move off with no pretence at keeping step, but preserving their dressing, sloping their arms correctly, and keeping silence just as they would when marching at attention. On the field of battle deployment for the fight may be in step or out of step; otherwise all movements out of reach of hostile fire are out of step, but in step immediately the companies come under effective fire. "German Drill Book," Part I, § 200.—Tr.

³ Article 2 has been mentioned before in reference to the military oath of allegiance. Article 43 gives the punishments "for sleeping, smoking (when forbidden), or lying down or laying down arms, or leaving a post when on sentry. In peace, medium or close arrest for at least fourteen days, or imprisonment or detention in a fortress for from 3 to 15 years; before the enemy, imprisonment, or detention in a fortress for from 10 years to for life, or death." Grierson, "Armed Strength of the German Empire," Part II, p. 116.—Tr.

genealogy of the Royal House from Frederick William IV to the present day. Procedure in making complaints.

(b.) By the non-commissioned officer.¹

- (1.) Barrack and barrack-room arrangements, especially method of arranging cot, putting kit in cupboard,² &c. Barrack-room orderly duty.
- (2.) Method of making requests and complaints. How to act in case of sickness.
- (3.) Bodily cleanliness. How to clean kit, &c.

General Remarks.—1. Particular attention is to be paid to regularity in barracks and in the barrack-room, also to standing to the cupboard (answering to standing to the cot in our Army—*Tr.*), to reports made as barrack-room orderly-man, to conduct in passages, on staircases, and in the barracks generally.

2. The men must be practised in making simple reports,³ also instructed how to act on falling in, or if ordered to fall out, in the course of a parade.

3. When marching to the parade ground, picking up step, changing step, front-forming, file-marching "out of step" should be practised.

4. All Officers of the unit to which the man belongs—his immediate superiors first of all—must be pointed out to him as soon as they are seen, and their names told him.

5. One hour daily must be devoted to aiming and position exercises. The close of the morning parade, or the commencement of the afternoon parade, is the best time for these practices.

¹ In connection with this theoretical instruction by the non-commissioned officer, Captain von Busse writes:—

"1. The instructor must take care not to instruct the man in more than is absolutely necessary; he must teach him only so much as it is expedient that he should know.

"2. When a fresh course of theoretical instruction is introduced, he must not put too much before the recruit all at once. He must rather divide the food for his mind into small portions, and not proceed further until he is convinced that what he has already taken in has been thoroughly digested.

"3. He must give his instruction as far as possible on the lines of the existing regulations, and as little as possible out of books of instruction.

"4. The time for theoretical instruction, which usually lasts one hour, should be so regulated that a quarter to half an hour is devoted to repeating what has been previously taught, and the remainder of the time to introducing new matter.

"5. In order to keep the attention of the recruits, which often, especially if the theoretical instruction be given in the evening, will have been already strained by the day's work, it is to be recommended that, when asking questions on what has been taught, the question should first be always put to the squad at large, and then a recruit be named to give an answer. By this means all the recruits are obliged to have their answer ready.

"6. From the very commencement, during the hour of instruction as well as on all duties, stress must be laid on the recruit's behaving well and speaking in a clear and loud tone of voice."

² In German barracks each soldier has a fairly capacious cupboard with lock and key, in which he stows his kit. There are no shelves as with us.—*Tr.*

³ In a similar work it is recommended that each day the non-commissioned officer of the squad should give to at least three men of his squad some simple message, which they will have to hand on to the Officer in charge of the company's recruits next morning. It is further recommended that various short messages, which would be likely to be sent on service, should be dictated by the Officer, and written down by the non-commissioned officers in their memorandum books.—*Tr.*

6. The clothing of the recruits must daily, from the very first, be most carefully inspected.

7. The lance-corporal must never instruct the recruit in anything new, he may only repeat what has been already taught.

8. Polish recruits and those from Elsass-Lothringen, who are weak in German, get two or three hours' instruction weekly from a specially qualified sergeant or lance-corporal.

9. As soon as rifles are entrusted to the recruits, a commencement must be made in instilling into them the elementary principles of the independent use of their weapon.

10. It is to be recommended that twice a week in the evening, instead of the kit cleaning and mending lesson, practical instruction in cleaning the rifle should be even thus early commenced, and that this should be continued during the following weeks.

2nd Week.

Dress.—As last week.

Physical Training.—1st—4th groups individually. The Double, individually. Ankle practice.

Physical Training with Rifle.—1st practice of the physical exercises with the rifle with both arms individually. Also the practice for working the wrist.

Rallying.—Fall in in file turned to right or left, with one pace interval. Principles of covering to be explained at the same time.

Saluting.—Passing the instructor at the attention, with head turned right or left. Saluting with the hand. Fronting and standing to attention.

Drill.—Position of soldier, turnings, dressing back independently with hips braced up, judging the time. Dressing individually in line with one pace interval by both flanks, on files advanced three or more paces in front of the alignment. Slow step in two motions, with hips braced up. Marching the squad in step and out of step, in line, and in file. Principles of the turnings.

Footnote adds: "As regards the value of the slow step, which is not regulation, the most varied opinions prevail. The correct value will be found in this case in a medium course. It is unnecessary to worry recruits who have well-shaped, straight, and supple legs with this extremely severe and fatiguing exercise; it should be applied rather to those only who are clumsy with crooked and stiff legs, and to such as are careless."

Manual and Firing Exercises.—Instruction in carrying the rifle at the slope.

Aiming.—Explanation of medium, full, and fine sights. Necessity of keeping the sights upright, and the foresight exactly in line between the centre of the backsight and the object aimed at. Instruction in the sight, full or fine, &c., to be taken at various ranges, and also the part of the target to be aimed at.¹

The non-commissioned officer makes the recruit aim a rifle at various points on a target, placed at 100 mètres distance, *e.g.*, the bottom of the target, the bull's-eye, &c.

Thorough description of the mistakes made in aiming, with practical instruction in the effects of not keeping the sights vertical, of the tip of foresight not being exactly in the line between the centre of the backsight and the object aimed at, of taking a fine or full sight, without defining the

¹ The standing sight of the present German rifle is 200 mètres, there is also a small flap, which is additional to the leaf of the backsight, for 300 mètres. Such instruction as the above is therefore most necessary.—TR.

reasons. The recruit will continue to make progress, until he at last aims correctly. Errors in aiming, with reference to § 16 (2) German Musketry Regulations. Practices in loading with dummy cartridges, and in filling and afterwards unloading the magazine, are to be constantly carried on. Practice in closing the left eye. Wrist exercises.

Position Exercises.—Position drill without rifle in one motion. The lance-corporal practises the recruits in shooting out the arm sideways from the shoulder, with the rifle grasped in the hand, to strengthen the arm, also in holding the rifle at full length of the arm in front of the body, and swinging it smartly from side to side to strengthen the wrist. Bringing the rifle to the shoulder, without regard to the regulation position for firing.

Training for Extended Order Work.—On the two days in the week¹ on which the recruits march out into the country, the non-commissioned officers practise their squads, formed as sections of six files, *i.e.*, groups, in the elementary principles of skirmishing with the rifle, according to §§ 127–130, German Drill Book, Part I. (These sections refer to a line extending at the halt and when in motion.—Tr.)

Interval between files, points of direction, how the individual man should act, and his position when in extended order, according to §§ 67–68 new Drill Book, Part I.² Bringing rifle to the shoulder without regard to the regulation position. These occasions must also be utilized to further imbue the recruits with the first elements of the independent use of his rifle.

A footnote adds: "Attention must likewise be paid to this point, *i.e.*, the independent use of the rifle when extended, on every possible occasion; the hours in which practices in aiming and position drill take place are especially adapted to such instruction."

Gymnastics.—Horizontal bar. Grasping the bar, also with both hands reversed and with one hand only reversed. Raising the shoulder to the bar with one hand reversed. Breasting the bar.

Bayonet v. Bayonet.—Nil.

Theoretical Instruction.—(a.) By the Officer. (See 1st Week.)

(b.) By the non-commissioned officers.

Names of and mode of addressing all the non-commissioned officers of the company, and all immediate superiors present in the garrison, and later the higher Officers, who may or may not be in the same place as the battalion, *i.e.*, Regimental, Brigade, Division, Army Corps Commanders.

(2.) Men's conduct in relation to superiors.

¹ The new German Drill Book, § 65, Part I, lays down: "At least twice in the week, as soon as they have served two or three weeks, the recruits must be marched out into the country to be trained in extended order work. This is a decidedly beneficial change during the period of formal drill instruction, which can best be furthered by the recruit bringing with him a certain insight into the practical application of the extended order formations practised on the drill-ground."

² The new German Drill Book lays down, in § 68: "For extended order work, the soldier must be practised in surmounting obstacles, especially jumping over or scrambling through ditches, scaling and climbing over walls, hedges, &c. Likewise he must be able to "steal" over the country, *i.e.*, advance protected against fire, by taking advantage of every bit of cover. At the same time, however, the fact must not be lost sight of, that in the majority of cases the straight way is the best way, and that the individual soldier can almost always find cover by going only a short distance out of his way, and by adapting himself to circumstances, *i.e.*, by stooping or crawling."

With reference to this question of taking cover, § 76 adds, in large type: "All considerations as to cover must, however, be looked on as secondary to those regarding fire-action."

(3.) Regimental organization from the squad up to the regiment inclusive.
General Remarks.—1. Before the midday break in the work, physical training; after the break, drill.

2. Squads fall in every morning in line with intervals, rear rank men covering on front rank.

3. At close of week squads are inspected separately in the position of the soldier, turnings, dressing back with hips braced up.

4. At close of week revision by non-commissioned officer of all theoretical instruction of 1st week.

5. From this time forward the recruits with rifles will be taken out into the country by an Officer, accompanied by a drummer and a bugler. Steadiness in marching and simple evolutions will be practised. The drum is to be played both on the march out and on the way back to quarters, that the recruit's ear may be accustomed to "Time" as soon as possible. By this means the subsequent instruction of the recruits in "Marching past" will become very much easier.

3rd Week.

Dress.—As previously. Belts and side-arms.

Physical Training.—Repeat groups of exercises 1—4 with squads of from 3—6 men. The double, individually. Bending and stretching the knee, ankle exercise particularly to be practised. 5th group of the physical exercises individually.

Physical Training with Rifle.—Practice 2 of the physical exercise with the rifle with both arms individually.

Practice 1 of the position exercises individually.

Rallying.—Falling in in one rank with one pace interval facing to the rear; also falling in on an alignment, oblique to the proper front.

Saluting.—As previously, with addition of saluting by twos and threes.

Drill.—Turnings, dressing back with hips not braced up individually, judging the time. In line with one pace interval, dressing by both flanks on points.

(The non-commissioned officers on the flanks are the "points for dressing on" in the German Army.—Tr.)

Slow step in one motion with hips braced up, the last half of the week with arms behind the back. Now and then the whole squad must pass the instructor in file with hips not braced up, considerable distance between the separate men being maintained.

Manual Exercises.—Instruction in carrying the rifle at the slope.

Aiming.—The non-commissioned officer makes one man aim with his rifle, using the standing (200 mètres) sight and the small 300 mètres flap, while another man checks his aim. Target, if possible, 150 to 200 mètres distant. Simple explanation of the line of sight, line of fire and the trajectory. The man learns the method of pressing the trigger of a rifle, which is lying firmly on a tripod. Aim to be checked according to regulation. Musketry Regulations, § 16 (3).

The non-commissioned officers make a rough copy of the results obtained, and enter these in a special register, kept for the purpose, so that later comparison may be made with subsequent entries, and that the progress of the recruits may be thus tested.

Position Exercises.—Position standing, with rifle, in one motion. The recruit learns the "Ready" position, correctly gripping the small of the butt.

Arm and wrist exercises with the rifle. Bringing rifle to the shoulder, without regard to the regulation position. Practice in loading continued.

Training for Extended Order Work.—Revision by the non-commissioned officer of what has been previously taught.

The Officer forms up the recruits of the company, who are then told off into tactical "groups" of from 4 to 6 files.

Elementary principles of skirmishing to be practised according to regulations, laid down in new Infantry Drill Book, Part I, §§ 127—130. Reformation also to be practised (Part I, § 142). Practical instruction in the independent use of the rifle.

Gymnastics.—(a.) Jumping practice :—Jumping by motions at the stand without spring-board. Jumping without the spring-board with three paces run, right and left leg leading.

(b.) Horizontal bar. Repeat previous practices. Breasting the bar, also with hands reversed. Taking each hand off the bar in turns, when hanging with straight also with bent arms. "Travelling" on the bar.

(c.) Horizontal beam. Simple jumping on and off. Changing position on it.

Bayonet v. Bayonet.—Nil.

Theoretical Instruction.—(a.) By Officer. (See 1st Week.)

(b.) By non-commissioned officer.

(1.) Ranks and distinguishing marks of all superiors, including naval officers.

(2.) Saluting in ordinary as well as in special cases.

General Remarks.—1. Before the midday break in the day's work, physical training with and without the rifle ; after the break, drill.

2. In marching to the drill-ground as well as to the drill-sheds, squads collectively will be practised in saluting.

3. On the drill-ground the recruits are kept thoroughly on the alert by taking measures tending to that end ; frequent changes of position, sudden orders to carry out something unusual will effect this.

4. Examination of recruits in reading and writing.

5. Non-commissioned officer's report, whether helmets and boots fit ; whether the recruits have sore feet or swollen legs.

6. The string, over which the recruit jumps when at jumping practice, will be kept till the commencement of the 6th week in the lowest hole.

7. At the close of the week, inspection of the squads in saluting, fronting, individual marching at the attention ; the double without the rifle individually.

4th Week.

Dress.—Drill order with caps.

Physical Training.—Repetition of groups of Exercises 1—5 with 3—6 men at a time. Group 6 individually. Lifting the legs, bending and stretching the knee ; ankle exercise to be uninterruptedly continued.

Physical Training with Rifle.—3rd practice individually. Practice 2 of the position exercises individually.

Rallying.—As previously in single rank, but without intervals. At the close of the week all the recruits of the company facing the front under the Officer.

Saluting.—As previously.

Drill.—Repetition. Turnings, &c., with 3—4 men at a time, one pace interval judging the time. Dressing individually by the right or by the left with one pace interval on files,¹ the alignment being oblique to the proper

¹ This dressing on files answers nearly to "dressing a line," § 6, Part III, of our Drill Book, three or more files advancing a certain number of paces, according to order, the remainder dressing up on these files.—TR.

front. Slow step in one motion, the first half of the week with arms crossed on the breast, the second half with arms hanging at the side. Quick step (114 paces per minute). Occasionally the whole squad passes the instructor in single file with arms hanging free, a considerable distance being maintained between each individual. Second half of the week, turnings on the march. Passing instructor one at a time with rifles at the slope but "out of step," instruction in carrying the rifle only being aimed at. Occasionally movements in squad in quick time, with front-forming and wheeling in two ranks.

Manual and Firing Exercises.—"The Order." Sloping arms and ordering in three as well as in two motions.

Aiming.—The lance-corporal continues the instruction in aiming, pressing the trigger, loading, &c., as hitherto, while the non-commissioned officer devotes himself more to the position exercises, and repeats the aiming practices only with those who are backward in aiming. Practical instruction in the figure targets¹ and their varieties, at the same time showing them to the recruits. Musketry Regulations, § 8 (3).

Position Exercises.—Ready position and gripping small of butt continued.

Position standing by numbers, without pressing the trigger, but firmly grasping the small of the butt with the palm of the right hand. The muzzle must be slightly supported in front during this practice. Each recruit explains as well as he can in his own words the various motions of coming to the Present.

Training for Extended Order Work.—Instruction on the extended line, in its normal form, repeated by the non-commissioned officers to their squads, and by the Officer to the recruits of the company collectively.

Movements of an extended line § 131. Part I, new German Drill Book.

Likewise making use of ground (free field of fire, getting a rest for the rifle, getting cover) will be explained to the recruits, small detachments of trained soldiers illustrating the instruction. This will be repeated occasionally in the following weeks.

Judging Distance.—Measuring paces. 100 yards laid down accurately and then paced out over different ground surfaces. Draw necessary appliances.

Gymnastics.—(a.) Jumping practice. Repeat. Jump standing in one motion.

(b.) Horizontal bar. Repeat. First position for vaulting the bar. Bending and stretching the arms twice, with hands resting on the bar. Taking hands alternately off bar, when hanging with arms straight, also with bent arms.

(c.) Horizontal beam. Walking upright along the beam.

Bayonet v. Bayonet.—Nil.

Theoretical Instruction.—(a.) By the Officer.

Musketry instruction, with strict adherence to the Musketry Regulations. Especial attention to be given to § 5, and generally to practical musketry.

¹ The figure targets used in the German Army are of a most practical nature. They are made of paper, with a backing of canvas, and represent a German soldier in drill order (i.e., with blue tunic, dark trousers and accoutrements, red facings, with rifle under the arm, and cap on the head). The standing figure is nearly 5 feet 7 inches high, and the Musketry Regulations contain a plate, showing where the figure is to be cut through, if a "head and shoulder" or kneeling, or half or three-quarter length target is required. When required for use this figure is fastened on to a very rough frame, consisting of a lath, varying in length, according to the size of the figure, with two or more cross-pieces nailed to it. These figure targets are used on the range, and also for field-firing. Similar figures of mounted men in life size are also used at field-firing.—Tr.

(This section describes the influence of the atmosphere, of wind, and position of the sun on shooting.—*Ta.*) Use of the sights and regulations regarding holding the rifle. Independent use of the rifle, according to the Musketry Regulations, § 35.

A footnote adds: "Less will be gained by the recruit having an accurate knowledge of the angles formed by the line of sight with the line of fire, trajectory,¹ angles of elevation, &c., than by his being most thoroughly instructed in the practical use of his rifle."

(b.) By the non-commissioned officer.

The rifle, Model 71/84, and its treatment.

Footnote adds: "Particular attention must be called to the fact that the soldier is only required to know what is printed in larger type in the instructions regarding the rifle, Model 71/84. The recruit will also have already learnt so much concerning the treatment of the rifle during the practical rifle-cleaning hours (see 1st Week), that not many difficulties are likely to present themselves in his further instruction."

Bugle Calls.—During the 4th week the following must be learnt by the recruit:—

Reveille.

1st Post.

Tattoo.

Fire-alarm.

Footnote adds: "The almost universal custom is that the bugle calls are sounded during the cleaning and mending hour, and the instruction in them becomes an amusement for the recruits. The weekly table of calls is handed to the bugler, and he is instructed to sound only the calls prescribed for the particular week, and these slowly and repeatedly one after the other."

General Remarks.—1. When the non-commissioned officer told off in the company for musketry is available, he will henceforward devote each day

¹ The Germans have a most ingenious method of practically showing the recruits what the trajectory of the rifle is at various ranges. Supposing that it desired to show them the trajectory at 400 metres. The squad is drawn up, and points are thrown out to the front at every 50 metres up to 400. These men have in their hands a stout lath, about 6 feet long, to which is attached a flat metal disc, painted white with a black bull's-eye in the centre; these discs being larger in size the further the man who holds it is from the squad.

On each lath in succession, i.e., at 50, 100, 150, &c., up to 400 metres, is marked the proper height of the trajectory for any given distance at the spot where the lath is being held. On the command being given to set the discs at 400 metres, each man slides the disc to the 400 marked on his lath, and fixes it there by a screw, which passes through the socket, by means of which the disc is attached to the lath. The man at 400 metres naturally does not move his disc. The men will next be ordered to rest the foot of their respective laths on their waist-belts. The squad of recruits can now be looking at the bull's-eye at each distance, see at a glance exactly what the path of a bullet would be, if they fired from their present position at the breast of a man standing at 400 metres distance, and between what distances men standing would be safe from their fire. Or the men may be ordered to kneel, and the man at 400 metres to rest his disc on the ground. The others then rest the butts of their laths on the ground, and the recruits can see what would be the effect of firing kneeling from where they are at the foot of the man kneeling at 400 metres. The same thing can be done with numerous variations. In the German Army great importance is attached to this knowledge of the trajectory, as being a most important element in the training of the soldier to "use his rifle independently," which means that he must know what firing-position he must be in, what sight he must use, what part of an opponent he must aim at, so as to make sure of hitting, when he is acting entirely on his own responsibility in the fight.—*Ta.*

three-quarters of an hour or an hour to the aiming and position exercises with the squads. Especial attention is to be paid by him to recruits who have been put back in these exercises.

2. The non-commissioned officers report whether both pairs of boots fit, and whether the recruits have sore feet or swollen legs.

3. At the close of the week the squads are inspected in turnings, dressing independently on files with hips not braced up; jump standing, running jump off spring-board; breasting the bar with hands reversed, also with one hand reversed.

4. Non-commissioned officers revise the theoretical instruction of the 3rd and 4th weeks. Revision by Officer of theoretical instruction of first three weeks.

5. The Officer checks each individual man in aiming during this week: he makes a note of those who aim badly, and continues to check their aiming till improvement is noticed.

Bugle calls are sounded or whistled during the cleaning and mending hours and the recruits made acquainted with them.

5th Week.

Dress.—Drill order with caps.

Physical Training.—Repeat groups 1—6, by half squads, judging the time. The more difficult practices and the 6th group are still to be done individually. The double singly with dummy rifle. The man's position, carrying the rifle at the slope on the right shoulder, must at the same time be thoroughly checked.

Physical Training with Rifle.—Repeat practices 1—3, with 3—6 men at a time. Practice 4 by half squads; also 1st and 2nd practices of the position exercises.

Rallying.—As hitherto, under the non-commissioned officers. Further, all the recruits of the company fallen in facing to the front and rear, also in file turned right or left, under the Officer.

Saluting.—Passing the instructor at the attention with rifle at the slope.

Drill.—Turnings, &c., 3—4 men at a time in close order, judging the time. Dressing with one pace interval, 3—4 men simultaneously, on points and files. Rapidly covering on the right or left flank man, who is advanced a few paces.

Slow step in one motion with the left arm behind the back, and also with both arms at the side; the more advanced recruits with the rifle at the slope. Quick step (114 per minute). Turning and fronting on the march. Occasionally the whole squad must pass the instructor in single file, 15 paces distance being maintained between each individual.

Manual Exercise.—Sloping and ordering arms in 3 and 2 motions. At the close of the week, judging the time.

Aiming.—The lance-corporal acts as in the 4th week. The non-commissioned officer pays more attention to the position exercises.

Position Exercises.—The non-commissioned officer passes on to the position at the aiming-rest,¹ and at the same time makes the recruits load with

¹ The aiming-rest consists of a light vertical post about 4 feet high, to which is fastened at the top a flat cross-piece, about 5 feet long, 4 inches in depth, by 1½ inches in thickness. This piece is not exactly perpendicular to the post, but rises from right to left at an angle of about 12 degrees with the horizontal plane. On the top edge of this cross-piece are cut thirty small notches, each about 2 inches long by 1 inch deep. These notches are numbered, so that the soldier can always remember the notch which best suits him in aiming from the rest. Each squad has one of these aiming-rests for its own use.—Tr.

dummy cartridges. Only the position, not the aiming, is to be checked. The trigger is not to be pressed, but care must be taken that the sights are kept upright.

Training for Extended Order Work.—Repeat what has been taught hitherto. The recruits will be practised in the open country in the various positions for firing, viz., standing, kneeling, lying down, behind thick and thin trees, behind earthworks, shelter trenches, and other objects. §§ 69—77, Part I, new German Drill Book.¹

Judging Distance.—50, 100, 150, 200 mètres to be marked out with banneroles. Soldiers (standing, kneeling, lying down) to be placed by them. The recruits must get a thorough idea of the distances first by the banneroles and afterwards by the men alongside. Apparent size of the men at the various distances, and distinctness with which they can be seen; explanation of the various influences which affect the vision. Transposing paces into mètres.

Gymnastics.—(a.) Jumping practice. As before.

(b.) Horizontal bar. First position for vaulting, with a run up to the bar. Bending and stretching each leg alternately when hanging from the bar; changing grip of the hands.

(c.) Horizontal beam. Turnings on it.

Bayonet v. Bayonet.—Nil.

Theoretical Instruction.—(a.) By the Officer. See last week.

(b.) By the non-commissioned officer. Same as last week.

Bugle Calls.—The general call.

The battalion call.

The four company calls.

General Remarks.—1. In the morning before the midday break the non-commissioned officer gives half an hour's physical training, a quarter of an hour's physical training with rifle, both by half-squads, then drill; in the afternoon one hour's gymnastics, then drill.

2. Seeing that the non-commissioned officer for the present and for some little time to come must devote himself particularly to position exercises, and also as experience teaches that the recruits lose ground in readiness in aiming, it appears necessary that he should occasionally during the week take the squad, especially such as are doubtful in aiming, to the tripods, and make them aim with the rifle resting on a sand-bag.

¹ Section 71 lays down: "For accuracy and comfort in aiming when lying down, it is especially important to get support for the rifle." At German manoeuvres one constantly sees this precept carried into effect. A firing line, if checked in a position where no natural support for the rifle is obtainable, as in an open field, immediately proceeds to obtain it artificially. Every other man carries a small spade: while therefore his comrade keeps up the fire on the enemy, the man who has the spade throws up a small mound of earth in front of him in two or three minutes, or merely cuts out a few sods, which could not afford him effective cover, being intended only to act as a rest for his rifle. He then hands his spade to his comrade, and himself opens fire.

Sections 73, 74, 75 give directions for firing from behind thick or thin trees, breastworks, and add that the soldier is to be instructed in making use of walls, hedges, ditches, and even unimportant irregularities of ground to obtain cover and get a rest for the rifle. In firing from behind *thick* trees the left forearm is to be rested against the tree, while the palm of the left hand is to be pressed against the trunk of a *thin* tree, the rifle being supported between thumb and forefinger. The fact that the German soldier is taught to press his rifle to the shoulder as much with the right hand as with the left makes it possible for him to fire from such a position.

—Tr.

3. At the close of the week inspection of the squads in Position, in two ranks with intervals; dressing singly on points; marching individually; sloping and ordering individually; breasting the horizontal bar; "traveling" along the bar; bending and stretching the arms with hands resting on the bar; position standing without aiming or snapping.

6th Week.

Dress.—Drill order with helmet, chains up; afternoons with caps.

Physical Training.—Repeat groups 1—6 under the non-commissioned officer by squads. Recruits who are clumsy and backward must still be taken individually. Groups 7 and 8. The new practices individually at first, afterwards with 3—6 men at a time.

Physical Training with Rifle.—Repeat practices 1—4 with 6—8 men at a time. Practice 5 individually. Practice 3 of the position exercises.

Rallying.—As previously under the non-commissioned officers, with rifles at the slope. All the recruits of the company in column of sections by the right or left without rifles.

Drill.—Turnings singly with the rifle at the slope; 6—8 men at a time in touch without the rifle. Dressing as previously individually, and with 3—4 men at a time, sloping arms. Slow step in small parties with interval, turning and fronting on the march to be practised at the same time; slow step individually with rifle at slope, at same time turnings; quick step (114 per minute) individually without rifle with turnings, occasionally the whole squad in single file going past with 15 paces distance between individuals. The double individually with sloped arms. "Marching past" the instructor man by man without the rifle, heads being turned to the right.

Manual Exercise.—The Present in 2 motions, sloping from the Present in 3 motions. Sloping arms from the Order and *vice versa*, judging the time, individually and also 2 or 3 men at a time.

Aiming.—The lance-corporal acts as in the 5th week. The non-commissioned officer devotes himself particularly to the position exercises.

Position Exercises.—The non-commissioned officer, after the recruit has learnt to load with dummy cartridges at the aiming-rest, teaches him the method of pressing the trigger, checking his aim being no object. Next comes snapping, a dummy cartridge being in the rifle,—position standing,—checking aim no object. The rifle should have some sort of support.

Training for Work in Extended Order.—Repeat and continue the different firing-positions with all sights. A man having been placed to represent an enemy, for the present at a short range, the non-commissioned officer must now show the recruit how to make use of the ground so as to get the fullest effect for his own fire, at the same time reducing the effects of the enemy's fire to a minimum. Further instruction in §§ 78—80, Part I, new German Drill Book.

Judging Distance.—The recruits must point out different objects, 50, 100, 150, and 200 metres distant from any given point. The distance between these points must then be paced out, and the paces put into yards, or it can be measured with a tape.

Gymnastics.—(a.) Jumping practice. Repeat. The string is now raised a bit.

(b.) Horizontal bar. Repeat. With hands resting on the bar, and arms being kept straight, leg to be raised sideways till on a level with the bar. Also with hands resting on bar, taking one hand off and changing grip of hands. First motions in breasting the bar and passing one leg over it, with hands grasping the bar from both sides, *i.e.*, one hand reversed. Bar to be at height of man's shoulder.

(c.) Horizontal beam. Repeat.

Bayonet v. Bayonet Practice.—Nil.

Theoretical Instruction.—By Officer and non-commissioned officer. Same as 4th and 5th weeks.

*Bugle Calls.*¹—March (slow and quick step).

Halt.

Assemble.

Alarm.

Repeat all calls learnt hitherto.

General Remarks.—1. Mornings before the midday break, quarter of an hour's physical training, quarter of an hour's physical training with rifle, then drill. Afternoons, one hour's gymnastics, then drill.

2. From the middle of this week onwards greater stress is to be laid on the manual and firing exercises.

3. The non-commissioned officers report whether the recruits have sore feet or swollen legs.

4. At the close of the week the squads are inspected in sloping from the Order and *vice versa*; quick step (114 per minute) individually, with turnings without rifles, position standing at the rest with loading and snapping, aiming being no object; physical training, groups 1—6.

7th Week.

Dress.—As previously. Chains down. Afternoons, caps.

Physical Training.—All recruits of the company repeat groups 1—8 under the non-commissioned officers. Groups 9—10, being new practices, individually, afterwards 3—6 men at a time.

Physical Training with Rifle.—Repeat practices 1—5, inclusive, in the squad entire. Practice 6 individually. Position exercises with 3—6 men at a time.

Rallying.—As previously.

Saluting.—As previously. By squads with and without rifles.

Drill.—Repeat what has been taught. Turnings, &c., with sloped arms, 6—8 men at a time in close order. Dressing man by man on an alignment, perpendicular to the front, on points; also on alignments perpendicular or oblique to the proper front on files, with sloped arms. Slow step, with sloped arms, in small parties, with some interval between individuals. At the same time turnings and fronting on the march. Quick step (114 per minute) individually with sloped arms, with turnings and half turnings; marking time and changing step. Occasionally quick step (114), the whole squad passing the instructor in single file with sloped arms, 15 paces distance being kept between individuals; also the same practice with the head turned to the right. Marching in column of threes and fours, with greater distances between sections than the normal.

From the middle of the week onwards, passing instructor in slow time

¹ With regard to the bugle call for the "March," the new German Drill Book says: "If this call is sounded in usual time, troops step off at the quick; if sounded very quickly, they will double up. In the transport of troops by rail, it means that the men leave the carriages." Regarding the "Assemble" (in the open, in close order) it lays down: "If the battalion call is sounded before it, it means:—

"1. Alarm (most rapid assembly possible in full marching order on the alarm parades, or occupying specially ordered points).

"2. Conclusion of manœuvres for the time being (on which all troops without further delay march back to their billets or to any other place where they are to be quartered)."—T.E.

with sloped arms by beat of the drum, head to the front, distances between individuals being maintained; also the same practice by half squads with intervals.

Manual and Firing Exercises.—The Present, and sloping from the Present, judging the time; sloping from the Order individually and ordering by half squads, judging the time. From the middle of the week onwards coming to the Ready from the Slope and loading rifle as a single-loader in five motions.

Aiming and Position Exercises.—The instruction in aiming, which has previously been given, is now repeated, attention being at the same time paid to a good position at the aiming-rest. The aim must be checked by means of auxiliary sights; at first aiming without pressing the trigger and releasing the spring, afterwards this also being done. Drawing in the breath to be practised.

Training for Work in Extended Order.—Movements of the separate groups under the group-leaders in broken ground, being opposed by a skeleton enemy. The Officer commences practising the men in fire discipline in the group.—New German Drill Book, Part I, §§ 133—142.¹

¹ The gist of these sections is as follows:—

§ 133. Firing on the move only to take place exceptionally.

§ 134. At drill, sights are to be most carefully set to distance ordered.

§ 135. The word of command to an extended line to be as short as possible, and to give first direction, then the object to be fired at, then the distance, and lastly the kind of fire.

Instance: (a) At the green hill top. Artillery! Sights 800 to 900! Ready! Present! Fire! Load!

(b) Right in front, extended line lying down! Sights 500! Independent firing.

§ 136. Ceasing fire on word of command or whistle sound, and recommencing on order "Continue fire!"

§ 137. Fire to be effective depends—

(a) On hitting;

(b) On concentrating fire.

Musketry regulations lay down size, &c., of objects to be fired at at various ranges, to get good results.

§ 138. Control of fire in action—

Zug-leader to keep the fire of his zug under his control as long as possible.

Intervals to be kept between züge in firing line.

Zug-leader to keep two or three men who are good at judging distance near him.

Distance to prominent objects to be measured, if possible.

Otherwise use of map or simple judging distance recommended.

Frequently changing objects to be fired at to be avoided.

§ 139. Kinds of fire to be employed:—

Rapid fire.—Against objects which offer a good mark for a short time only, at short range.

Also against artillery at ranges over 800 mètres.

Volleys.—Best for keeping troops in hand and finding range. Impossible, however, to make voice heard by an extended line in the roar of battle. Can therefore only be employed at commencement of a fight, or when troops are not being fired at by enemy.

Independent firing therefore usual for an extended line. Men are more likely to hit. The leader, by first stopping fire by whistle sound, can order more rapid (or slower) firing! or magazine fire! as he thinks fit.

Slow firing is that no two men of a file have their rifles up at the same time. In rapid firing this does not matter.

§ 140. Fire discipline. This embraces the conscientious carrying out of all orders

Judging Distance.—Make the recruit pace up to a point, which he judges to be 25, 50, 100, 150, or 200 mètres from an object in the open country, or to be a certain distance from where he is standing, measured in a straight line. Pacing, turning paces into yards, or measuring the distance with a tape.

Gymnastics.—(a.) Jumping practice. Repeat. For jumping at a stand, string 20 inches high, with a run, 2 feet high.

(b.) Horizontal bar. Repeat. Grasping the bar from both sides (*i.e.*, one hand reversed), raise the chest to the bar and pass leg over it. Bar to be at the height of the shoulder.

(c.) Horizontal beam. Repeat.

(d.) Vertical rope. Swarming.

Bayonet v. Bayonet.—The fighting position without rifle, first in two motions with hips braced up; afterwards in one motion, without rifle. Explanation of the "fighting line." Advancing and retreating one pace, without rifle.

Theoretical Instruction.—(a.) By the Officer, as in the 4th, 5th, 6th weeks.

(b.) By the non-commissioned officer.

(1.) How the soldier should conduct himself in marching to the rifle range. What his duty is on the range itself. (§ 25 German Musketry Regulations.)

(2.) Ammunition and targets (§ 8, *ibid.*).

Bugle Calls.—Attention.

The Alert.

Fix bayonets.

Commence firing.

Repeat all calls learnt previously.

General Remarks.—1. While the squads are at aiming and position exercises the Officer takes the opportunity of daily inspecting one squad in them. He must always pick out some particular point to check, *e.g.*, a proper grip with the right hand; pressing the trigger and releasing the spring; making the recruits aim at his eye, &c., &c.

given to the firing line in the course of the fight, also the most exact observance of the regulations regarding the use of the rifle and the man's conduct in action. Fire discipline further demands steadiness under hostile fire, even though it must not at the moment be replied to, care in firing each shot, and skilful use of the ground to increase the effect of one's own fire. It also requires that the man's attention should be constantly given both to the leader and to the enemy, and that the man should at once cease firing on his leader sounding his whistle, or on his getting the order to do so in any other way.

Fire discipline must by training so become a second nature in the man that he never loses its influence, even when in course of a fight complete control of the fire by the leader becomes impossible, and when finally nothing remains to guide the conduct of the firing line but each man's own judgment, or the example set by particularly brave and judicious soldiers. In order to create and keep alive in the man self-reliance he must be made accustomed to circumstances in action, when all control of the firing has ceased, and he must be taught how to act in such circumstances.

§ 141. Observing the effect of fire.

§ 142. Re-formation of an extended line.

¹ With regard to the meaning of the call which is here translated the "Attention," the German Drill Book says: "During the transport of men by rail the men enter the carriages; on the march they close to the side of the road to clear the way."

"Commence firing is only to be employed on the range to warn the markers that firing is about to commence."—Tr.

2. In order to thoroughly check the aiming of the recruits it is necessary that the non-commissioned officers should have auxiliary sights with them, which they must always use.¹

3. From this time on the physical training is to be carried out by the non-commissioned officers going through, with all the recruits of the company fallen in, all leg, hip, arm, and head exercises, in turns, the exercises for each separate part of the body being now grouped.

4. At the close of the week, the squads are inspected in the Present and in sloping arms. Individual marching with sloped rifle, head to the front. Position standing without rest, including loading and snapping, the auxiliary sights not being employed. Rallying. Physical training, groups 6—8 inclusive; physical training with rifle with both arms, practices 1—5, and the position exercises. At the horizontal bar, taking hand off the bar and changing grip, when the hands are resting on the bar with arms straight; also the first motion in passing the knee over the bar from the position described above. (See 6th Week.)

8th Week.

Dress.—As hitherto.

Physical Training.—Repeat all the groups of exercises with the whole of the recruits of the company together, under the non-commissioned officers, one or two groups of exercises on each day.

Physical Training with Rifle.—Repeat practices 1—6 inclusive, and practice 7 by squads. Repeat position exercises by squads.

Rallying.—As previously under the non-commissioned officers. Also the recruits of the company do all formations, hitherto practised, collectively with rifles.

Saluting.—As previously.

Drill.—Turnings, &c., with sloped arms by squads in rank entire. The same practice with 2 files in close order. Dressing by squads in rank entire on points and on files. Individually passing instructor in quick time, with rifle at slope. Turnings and fronting on the march; half turns; marking time and changing step. The whole squad marching past the instructor in single file, 15 paces distance between man and man, with head turned to the right. Squad marching to the front in slow and quick time, in single rank with intervals, to the beat of the drum, heads to the front.

Manual Exercise.—Coming to the Ready position and loading from the Slope, in five motions. End of the week, Ready, Present, return to Ready, firing, loading without looking at breech, putting rifle at safety, &c. Practise unloading. (New German Drill Book, Part I, § 38.)

Aiming and Position Exercises.—Recruits aim, standing without rest, being checked by means of auxiliary sights, at first without pressing trigger and releasing the spring, afterwards doing so. (Eye to remain fixed on the object.)

Footnote adds: "To prevent losing time by fixing the auxiliary sights on every rifle in turn, the non-commissioned officer should make use of one only, to which they can be accurately fitted."

The recruits are instructed in method of signalling hits.

The musketry non-commissioned officer of the company begins practising the recruits in firing with "aiming-ammunition"² from the aiming-rest, auxiliary sights being screwed on.

¹ A particular form of auxiliary sights, called the "Brunn'sche Spiegelapparat," to be had of the Büchsenmacher Thurath of Stettin, is particularly recommended.

² "Aiming-ammunition" corresponds to our Morris tube. It is simply an ordinary cartridge-case with a cardboard cylinder about 1 inch long, containing a

Training for Work in Extended Order.—Repeat what has gone before. Movements as a "zug," under the Officer, the group-leaders being in their places, in different kinds of ground against a skeleton enemy. Taking advantage of the ground, if not too damp; raising sights, fire discipline, stopping the firing by the whistle; attack, defence, and retiring to be thoroughly practised.

Judging Distance.—Judging distance in most varied ground up to 200 metres by dividing the required distance into equal portions, one of which can be judged with accuracy, or if preferable by finding lateral points to go by.

Gymnastics.—(a.) Jumping practice. Repeat. Jumping at a stand over 20 inches, with a run over 26 inches.

(b.) Horizontal bar. With hands resting on the bar and arms stiff, raising the body to a horizontal position over the bar. From passing the knee over bar, as before described, change to the "leg acting" position. Bar to be at the height of the shoulder.

(c.) Horizontal beam. Jumping off, when standing sideways.

(d.) Vertical rope. As before.

(e.) Plank ladder. Climbing, hand and foot on same side together.

Bayonet v. Bayonet.—Position with the rifle in two motions, afterwards in one. Explanation of fighting distance and unguarded points.

Theoretical Instruction.—(a.) By the Officer.

Education for work in extended order. Extended Order, new German Drill Book, Part I, §§ 67—80, 127—142. Also how the soldier should conduct himself in the fight, *ibid.*, Part II, §§ 57—61.

Footnote adds: "The Officer should sift out from the above only just so much as the soldier ought to know."

(b.) By the non-commissioned officer.

1. Soldier's pay and allowances.

Footnote adds: "The non-commissioned officers will by this time have so thoroughly instructed their recruits in this matter on pay days, that the instruction in the pay, &c., cannot now present many difficulties."

2. Subdivision of an army corps into Divisions and brigades. Repeat the subdivisions of the brigade downwards.

3. Houses of the immediate superiors and way to them; position of the different barracks, hospitals, offices, magazines, Government workshops, railway stations, and central post offices.

Footnote adds: "It is to be recommended that in every barrack room a nominal roll of all immediate superiors, especially of those who are stationed in the garrison, should be posted up, also a list of addresses and a plan of the town, on which the houses of the above as well as the military and public buildings are plainly marked."

Bugle Calls.—Repeat all hitherto taught.

General Remarks.—1. Physical training, without and with the rifle, as well as position exercises, will be henceforward practised, as hitherto, under the non-commissioned officer, not in the gymnastic hour, on two days in the week only.

2. The Officer inspects each squad daily, either on falling in, or during the parade, in the Present and in Sloping arms, in order to ensure uniformity in the manual exercise.

3. The non-commissioned officers—never the lance-corporals—are in the future to pay particular attention to those recruits who are backward in drill,

small round bullet and some powder in rear, pushed into the top. The cylinder is closed at both ends with very thin paper, so that the charge is exploded by the cap of the cartridge-case. The bullet flies accurately up to about 20 paces.—Tr.

as well as to those who are weak in the manual exercises. Should other non-commissioned officers of the company on the days on which it does guards, &c., not be on duty, it is to be recommended that they should be temporarily told off to the recruits, to help on the more backward.

4. At the close of the week the squads are inspected in position with sloped arms in rank entire; marching singly with sloped arms, head turned to the right; the whole of the position drill with aiming and snapping at the aiming-rest; "pulling up" to the bar of all kinds, grasping the bar from both sides (*i.e.*, one hand reversed) raising the chest to the bar, then passing first the right leg, then the left leg over it. Physical training, groups 9 and 10.

5. Instruction of squads by non-commissioned officers. Lecture by the Officer on all that has been taught from the 4th to the 7th week.

9th Week.

Dress.—As hitherto.

Physical Training.—As hitherto. The whole of the groups are gone through by the recruits of the company collectively judging the time, taking the word from the Officer.

Physical Training with Rifle.—Repeat the practices with both arms 1—6 inclusive, by squads, also the position exercises. Practices with rifle for strengthening arm and wrist.

Rallying.—As hitherto under the non-commissioned officers. All the recruits of the company in company column, fronted and turned about, under the Officer.

Saluting.—As hitherto.

Drill.—Turnings, &c., individually to be repeated; the same in two ranks. Squads dressing in close order by the right and by the left on points and on files, on alignments perpendicular and oblique to the proper front. Passing the instructor individually as hitherto. The whole squad marching past the instructor in single file, distance of 10 paces between man and man, heads to the front, also turned to the right. Marching to the front, 2, 3, 4, 6 men together in close order. Squad, formed as a section in two ranks, marches by file, as practice for marching past, when the four squads of the company fall in together.

The squads are told off as sections in two ranks, and drill as sections, in preparation for drill when the squads are brought together, supposing that this is ordered.

The whole of the recruits of the company to march man by man past the Officer with 10 paces distance, in order that uniformity of pace, cadence, (a metronome being used), position of the body, and carrying the rifle may be checked.

Marching past in quick time by squads in single rank with intervals, at first eyes front, afterwards eyes right. The drums and regimental band play the squads past.

Manual and Rifle Exercises.—Loading, firing, returning to ready, and ceasing fire without filling the magazine, &c.; also the same practice two and three men together, shoulder to shoulder, afterwards in file.

From the middle of the week onwards, practice in loading, firing, &c., individually, with filling the magazine. Emptying the magazine to be practised.

Footnote adds: The fully trained soldier must be able to fill the magazine, and load his rifle in 25—30 seconds, and fire 18—21 well-aimed shots in the minute. Recruits, however, are only expected to load in 30—35 seconds, and fire 13—16 aimed shots in the minute.

Manual and firing exercises by squads in single and double rank on the

word of command, judging the time. Manual and firing exercises individually to be repeated.

Aiming and Position Exercises.—Firing with aiming-ammunition under the non-commissioned officer, auxiliary sights being used. The non-commissioned officers of the squads practise their men more especially in position at the rest, also in position standing without rest and kneeling, the auxiliary sights being always used. Especial attention must be given to those who aim badly; they are to be constantly taken to the tripods and their aim checked.

Training for Extended Order Work.—Repeat what has gone before. Formation of the company column. Should there not be sufficient files to give 3 züge, each with at least 2 groups of from 4–6 files, only 2 züge will be formed.

All movements in extended order, which have hitherto been practised by the zug, will be now repeated and gone through afresh by the company column.

Practice in bugle calls. "Rapid Advance," "Assemble," "The Alert," "Fix Bayonets," to be sounded.

Judging Distance.—Judging distance up to 200 yards on moving targets (the lance-corporals to be used in this capacity) in various positions, and at the same time, instruction in the independent use of the rifle.

Gymnastics.—(a.) Jumping practice. Repetition. Jumping, standing over string 20 inches high, and with a run over 2 feet 4 inches.

(b.) Horizontal bar. Repetition. Passing knee over bar from position before described, also right and left leg acting; the bar is to be at the height of the men's heads for this practice. Circling the bar, it being at the height of the shoulder.

(c.) Horizontal beam. Repeat.

(d.) Vertical rope. Repeat.

(e.) Plank ladder. Repeat.

(f.) Inclined ladder. Climbing the ladder with right hand and foot acting together. Hands to grasp the rungs, afterwards the sides of the ladder.

Bayonet v. Bayonet.—Repetition. Thrusts with rifle held firmly in both hands by motions, the pauses between the motions of thrusting and recovering being gradually lessened.

Theoretical Instruction.—(a.) By the Officer. As last week.

(b.) By the non-commissioned officer.

(1.) The different order, in which the soldier must turn out for different duties, parades, fatigues, roll-calls, for guard and orderly work, &c., also how the various uniforms in the soldier's possession must be worn.

(2.) Military obedience.

(3.) Military punishments.

(4.) Military decorations and rewards.

Bugle Calls.—So far as is necessary, all calls will be henceforward sounded during the week in varying order.

General Remarks.—1 Remarks 1, 2, and 3 of the 8th week again apply.

2. Experience teaches that recruits find much difficulty in manipulating the magazine rifle, while, during the short hours of drill, the time for practically training them in it must necessarily be very limited. It is therefore advisable to have already prepared them theoretically, as far as the institution of an hour of theoretical instruction occasionally, during the previous weeks, instead of the popular and customary cleaning and mending hour in the evening, will admit of this being done. During this hour, the non-commissioned officers of squads must by word of mouth, by illustrations, and by practical work with the magazine rifle, strive to stir the intelligence of the recruits.

3. The Officer inspects carefully each individual in coming to the Ready from the Slope, and the squad in single rank, coming to the Ready from the Order, judging the time.

4. At the close of the week the squads are inspected in : presenting arms ; loading in motions also judging the time, without filling the magazine—the above individually ; in turnings, &c. ; dressing by squads in close order on points and files ; rallying ; piling arms ; resting the hands on the horizontal bar, and keeping the arms straight, raising the body horizontally over the bar ; right and left leg acting on the bar ; physical training with rifle with both arms ; aiming and snapping in standing position without rest ; the instruction, which has been given by the non-commissioned officers.

10th Week.

Dress.—As hitherto.

Physical Training.—As hitherto.

Physical Training with Rifle.—Repeat all that has been taught up to present. Also practices 1 and 2 with one arm individually. Group 1 of practices with both arms.

Rallying.—Only now for the recruits of the company collectively under the Officer. Squads fall in in two ranks in company column by the right or left. The rallying now takes place only on the word of command being given : “Fall in, Double—March,” or on the Assemble being sounded.

Saluting.—Repeat.

Garrison Guard Duty.—Practise guard mounting and dismounting.

Drill.—Turnings, dressing as hitherto, also by advancing or retiring three centre files at the double ; individual marching, &c., as hitherto, by squads in single file with heads turned to the right, 8 paces distance being kept between man and man. Marching to the front by squads as hitherto. Marching by files, with heads turned to the right, as a preparation for the march-past in the zug ; the same practice at the double. The whole of the recruits of the company pass the instructor singly to gain uniformity in pace, cadence, position of the body, and carrying the rifle—8 paces distance between man and man. Marching past in quick time by squads in single rank with intervals, heads at first straight to the front, afterwards turned to the right ; same practice at the double, the drums and regimental band playing them past. Go through the formation in which the recruits will be drawn up for the inspection.

Drill by sections ; wheeling by sections, turning into file, forming to the front on the march. Drill with all the recruits of the company collectively to be commenced ; manual and firing exercises and file marching.

Manual and Firing Exercises.—Repeat the whole of the manual and firing exercises individually and by squads ; bringing the rifle down for the charge and fixing the bayonet ; loading individually when on the move from the Slope, also with filling the magazine. Manual and firing exercises with all recruits of company fallen in, the same as a rear rank.

Aiming and Position Exercises.—Shooting with aiming-ammunition from the rest under the company musketry non-commissioned officer as hitherto, The non-commissioned officers of squads continue the same aiming practices as hitherto and check, by means of auxiliary sights, the recruits firing with blank from the rest. Position standing without rest, also holding rifle to shoulder with one hand only, to be continually practised. Positions kneeling and lying down with rifle to the shoulder and leaf of the backsight raised, auxiliary sights also being employed. If weather be fine, ball practice will be commenced.

Training for Extended Order Work.—Continuation of work in company column, with special reference to §§ 187—195, Part I, new Drill Book.

The more advanced training of men in extended order work, as laid down in the Musketry Regulations, is now to be commenced (§ 36, Musketry Regulations).

Gymnastics—(a.) Jumping practice. Repeat.

(b.) Horizontal bar. Repeat. Throwing leg over bar with hands reversed. Bar at height of man's shoulder.

(c.) Horizontal beam. Repeat.

(d.) Vertical rope. Repeat.

(e.) Plank ladder. Repeat.

(f.) Inclined ladder. Repeat.

Bayonet v. Bayonet.—Repetition. Thrusts with rifle held firmly in both hands, by numbers.

Theoretical Instruction.—(a.) By the Officer. (Same as 8th and 9th weeks.)

(b.) By the non-commissioned officer.

(1.) The soldier on detachment, as orderly, as member of court-martial,¹ also as witness.

(2.) Garrison guard duty. Objects of guards and sentries. Superior Officers. Dress on guard. What the soldier ought to know concerning relieving guards and sentries.

(3.) Repeat parts of previous instruction.

Bugle Calls.—See 9th week.

General Remarks.—1. See general remarks 1, 2, and 3 of the 8th week.

2. The Officer inspects the men daily in the same formation in which they will be drawn up for the company inspection, also dressed by the left. He also inspects the squads in turns with rifles at the Slope, at the Present, and at the Ready. The manual and firing exercises by squads individually.

3. Every day at the close, of the morning parade, marching to the front and marching past with drums and band.

4. The manual and firing exercises are now to be repeated most energetically, as in practising loading and firing from the magazine the position of the upper part of the body will have suffered, this being especially the case with clumsy and weakly recruits.

5. Only those recruits are to be taken to ball practice who have fulfilled at least twice the conditions of the 3rd class with aiming ammunition.

Footnote adds: "The Officer must, as far as possible, have seen each individual man fire with aiming-ammunition, before he allows him to go to the range to fire with ball.

6. At the close of the week the squads are inspected in the following: as drawn up for the company inspection; individual marching; position with rifle at Slope, Present, &c.; loading, firing, coming to the Order from Ready, filling the magazine, and using the rifle as a single-loader, then as repeater, and *vice versa*—individually by word of command; turnings, &c., dressing by squads; physical training, all the recruits of the company together, taking the word from the Officer; first three practices of the position exercises and wrist exercises with the rifle under the non-commissioned officers; circling the bar with hands reversed; breasting the bar twice, also three times with hands reversed, and also with one hand reversed only; climbing practices at the ladders and rope.

¹ In Germany there are always two or three members who are of the same rank as the prisoner: thus a R.C.M. for the trial of a private consists of a Captain as President, 2 First Lieutenants, 2 Second Lieutenants, 2 under-officers, and 2 privates. Grierson, "Armed Strength of German Empire," Part II, p. 111.—*Tr.*

Inspection of the squads in firing with blank and aiming-ammunition from the rest.

Lecture by Officer on theoretical instruction of weeks 8-10.

11th Week.

Dress.—As hitherto.

Physical Training.—As hitherto.

Physical Training with Rifle.—Repetition of what has hitherto been taught. Practice 1 and 2 of the exercises with one arm, by half squads; practice 3, individually, then 3-6 men at a time. Group 2 of the physical training with rifle with both arms. The Officer takes all the recruits of the company together in the physical training with rifle with both arms and in the position exercises.

Rallying.—As hitherto.

Saluting.—Repeat, especially saluting without the rifle.

Garrison Guard Duty.—Repeat dismounting, &c., guards; practise mounting and being relieved off sentry.

Drill.—Turnings, &c., as hitherto; dressing as hitherto, and also turned about. Passing instructor in single file with 6 paces distance, and marching to the front as hitherto. All recruits of company going past in single file, with 6 paces distance to get uniformity of step, &c.; marching to the front in double rank, heads to the front, to prepare for marching past in *züge*, also at the double. Marching past, as hitherto, with eyes right. Drilling in double rank; wheeling, turning into file, forming to the front on the march; breaking off files. All recruits of company drilling together; manual and firing exercises, file-marching, dressing by right or left on points and files on a perpendicular or oblique alignment, also turned about, wheeling by sections, turning into file, forming to the front—if the latter movements are ordered. At the close of the week marching past as a *zug*, also at the double, with drums and band. Go through formation in which recruits will be drawn up for inspection, and thoroughly drill the squads in it.

Manual and Firing Exercises.—Individually, also by squads in single and double rank, and with all the recruits of the company collectively. Individual practice in rapid aimed firing, loading from the pouch without and with use of the magazine. Loading from the Order.

Aiming and Position Exercises.—Firing with blank, aiming, and ball ammunition. All firing positions, especially standing and lying down without a rest, are to be constantly repeated under the non-commissioned officers.

Training for Extended Order Work.—Continuation of practices in company column with reference to §§ 169-173 and §§ 180-186, Part I, new German Drill Book. At the same time raising leaf of backsight, all kinds of fire (*e.g.*, slow, rapid, volley, independent, magazine), cease firing when using magazine, particularly to be practised.

The training of the men in extended order, according § 36, German Musketry Regulations, is, as far as the weather allows of it, to be continued over all sorts of ground up to 200 mètres.

Gymnastics.—(a.) Jumping practice. As hitherto.

(b.) Horizontal bar. Repeat. Throwing leg over the bar with hands reversed, bar at height of man's shoulder.

(c.) Horizontal beam.

(d.) Vertical rope.

(e.) Plank ladder.

(f.) Inclined ladder.

} Repeat.

Footnote adds: "The proper method of marching squads up to the various appliances must be paid attention to. The squads will be practised and inspected in this."

Bayonet v. Bayonet.—Repeat. Thrusts with rifle firmly held in both hands, judging the time.

Theoretical Instruction.—(a.) By the Officer.

The infantry rifle, model 71/84, and its manipulation. Revisal of separate courses of instruction, given by non-commissioned officers.

Footnote adds: "The Officer in charge of the recruits must at the inspection show that he is completely master not only of what he has himself had to lecture on, but also of what the non-commissioned officers have had to instruct the men in. It is therefore necessary that he should occasionally go through with the recruits, in order to get in perfect touch with them, one of the non-commissioned officer's themes for instruction."

(b.) By the non-commissioned officer.

(1.) Garrison guard duty. What the man ought to know of relieving guards and sentries. Duties on sentry.

(2.) Repeat parts of earlier instruction.

Bugle Calls.—See 9th week.

General Remarks.—1. See 1, 2, 3, of 8th week, and 2, 3, 4 of 10th week.

2. Firing with ball will be only so far continued, that fresh attempts will be made to bring on recruits who have not yet fulfilled the 1st practice. Continual and sufficient preparation of these recruits under the company musketry non-commissioned officer, with most thorough checking of their aiming by the Officer, is unconditionally necessary.

3. Every day the whole of the recruits march singly past the Officer, with absolutely correct distances and most accurate covering on the man in front. The Officer stands with the metronome in his hand.

4. At the close of the week the squads are inspected in bringing the rifle down for the charge; fixing bayonets, manual and firing exercises individually, also in single and double rank judging the time; included in above is loading as a front and rear rank man, with and without filling the magazine; practices 1 and 2 of the physical training with rifle with one arm; the whole of the practices at the horizontal bar.

Everything which will be done at the inspection must be repeatedly gone through from beginning to end. Attention must at the same time be given to the non-commissioned officers and lance-corporals, to see that they know what they have to do at the inspection. The Officer lectures on the instruction of the 11th week. Non-commissioned officers continue the instruction of the recruits.

12th Week.

Dress.—As hitherto; during the latter days of the week the helmets which will be worn at the inspection will be frequently put on, and new slings will be fitted on the rifles for the manual and firing exercises.

Physical Training.—As hitherto.

Physical Training with Rifle.—Repeat all that has gone before, also practices with one arm with the addition of group 3 of the practices with both arms by squads; the Officer also goes through the whole of the practices, with all the recruits of the company collectively.

Rallying.—As hitherto. Immediately after the rallying, all the recruits of the company fall in together and march past.

Saluting.—Repetition, especially without the rifle.

Garrison Guard Duty.—Repetition. Paying proper compliments when on sentry.

Drill.—Turnings, dressing of all kinds. Covering to be practised as before. Individual marching as hitherto, with eyes front and eyes right; this is

especially to be gone through with all the recruits of the company fallen in in single file, with correct distance between man and man, as laid down for the inspection; each squad marching straight to the front in two ranks, as practice for marching past in the *zug*. All the recruits of the company double past one by one, with distance laid down for the inspection. Marching and doubling past by squads in rank entire, also all the recruits of the company in two ranks. Drums and band to play them past. Go through the programme for the inspection. Drill with all the recruits of the company fallen in, the non-commissioned officers, &c., being in their places in the supernumerary rank.

Manual and Firing Exercises.—Individually and by squads to be repeated. Also the exercises in single and double rank by squads, also all the recruits of the company in two ranks. Rapid fire, loading from the pouch, and also using the magazine to be practised with all recruits of company collectively.

Footnote adds: "Before the inspection all dummy cartridges must be examined to see that they can readily be loaded: this to prevent jamming when using the magazine."

Aiming and Position Exercises.—Firing with aiming, blank, and ball ammunition. All the firing positions to be constantly repeated under the non-commissioned officers.

Training for Extended Order Work.—Repeat. Great importance to be attached to a proper use of ground, the various kinds of fire, correctly fixing sights, rapidly ceasing fire, and to smartness and rapidity on the part of those extended. The practices to teach the individual soldier what to do (*e.g.*, what position to take for firing, what sight to use, on what part of an opponent, whether mounted, standing, kneeling, or lying down, to aim) if acting on his own responsibility in the fight, to be continued; up to 200 metres, over varying ground, as far as the weather permits.

Gymnastics.—Go through all the practices which have been taught at the bar, beam, ladders, rope, in jumping, &c., which will be required at the inspection. The squads must be practised in mutually changing over from one set of appliances to another, without confusion.

Bayonet v. Bayonet.—Repeat.

Theoretical Instruction.—(a.) By the Officer.

Garrison guard duty. Arrests, manipulation of weapons. Revise former instruction, also separate courses of instruction, given by non-commissioned officers.

(b.) By the non-commissioned officers.

- (1.) Garrison guard duty. Paying proper compliments as sentries. How guards act after dark. Officer of the day. Rounds and patrols.
- (2.) Repeat parts of previous instruction.

Bugle Calls—See 9th week.

General Remarks.—1. See general remarks 1, 2, and 3 of 8th week, 2, 3, 4 of 10th week, 2 of 11th week.

2. All the recruits of the company, fallen in together, take the word from the Officer in the manual and firing exercises, also in drilling. The squads are inspected in practice 3 of the physical training with rifle with one arm, and practices 1, 2, and 3 with both arms.

3. The Officer lectures on the theoretical instruction of the 12th week. The non-commissioned officers continue the instruction of the recruits.

NOTICES OF BOOKS.

[It is desirable to correct an error into which we fell in noticing in the last number of the Journal Captain Glünicke's translation of the New German Field Exercise. Captain Glünicke is right, not wrong, in saying that: "Accordingly a company of 100 men ought not to occupy a front of much more than 40 yards." This sentence does not, however, occur in the original, but is a deduction from a particular sentence for English use. Hence the mistake.—L. A. H.]

The Decisive Battles of India from 1746 to 1849 inclusive. New Edition. By Colonel G. B. MALLESON, C.S.I. London: Allen and Co., 1888. Pp. 470. Size $7\frac{1}{4}$ " \times $5\frac{1}{4}$ " \times $2\frac{1}{4}$ ". Weight under $2\frac{1}{4}$ lbs. Price 7s. 6d.

This work has already been noticed in the Journal. The new edition is due, the author says, to the fact that two large editions have been exhausted, and the demand for it still continues. Under these circumstances he has been requested by the publishers to prepare for the press an edition which, from the smaller size and lesser price of the volume, shall bring it within reach of those who may hitherto have been deterred from reading it. We congratulate both the author and the publishers on their success.

Corazze e Torpediniere. Esame d'un Veterano sul Criterio degli Autori Antichi del Contre Ammiraglio F. V. ARMINGON, Genova. Topografia del R. Istituto Sordo-Mute, 1888. Pamph. Pp. 131. Weight under 6 ozs.

A record of the changes introduced into naval warfare during the last twenty years, dealt with in a popular rather than a technical style.

Reise S.M. Scheffes "Albatros," über Commando des K.K. Fregkapitän's A. Müldner, nach Süd-Amerika, dem Caplande und West-Afrika, 1885-86. Verfasst von J. F. V. BENKO, Corv.-Kap. Pola, 1889. C. Gerold's Sohn, in Wien. Pp. 463. Size 9" \times 6" \times $\frac{3}{4}$ ". Weight under 1 lb. 6 ozs.

A continuation of a series of voyages noticed from time to time in this Journal.

Memoir of Lieut. Rudolph de Lisle, R.N., of the Royal Naval Brigade on the Upper Nile. By the Rev. H. N. OXENHAM. Third Edition. London: Chapman and Hall, 1887. Pp. 297. Size $7\frac{1}{4}$ " \times $5\frac{1}{4}$ " \times $\frac{3}{4}$ ". Weight under 1 lb. 6 ozs. Price 7s. 6d.

A record of a brave sailor, a zealous Catholic, and a good man.

Two Scottish Soldiers: A Soldier of 1688 and Blenheim; A Soldier of the American Revolution; and a Jacobite Laird and his Forebears. By James FERGUSON. Aberdeen: D. Wyllie and Son, 1888. Pp. 162. Size 9" \times $5\frac{1}{4}$ " \times $\frac{3}{4}$ ". Weight under 1 lb. 10 ozs. Price 6s. 6d.

In this book we find a number of very interesting details of military history of the past, and also of the breech-loader of the past.

Historical Record of the Eighty-Ninth (Princess Victoria's) Regiment. Compiled by Rowland BRINCKMAN, Captain and Adjutant R. I. Fusiliers. Chatham: Gale and Polden. Pp. 235. Size $7\frac{1}{4}$ " \times $5\frac{1}{4}$ " \times 1". Weight under 1 lb. 2 ozs. Price 5s.

The publication of the Regimental Histories, authorized by the General Order of 1st January, 1836, was carried out only to a partial extent. Hence the history

of the 89th was never published by authority. Captain Brinckman has undertaken the work, and in this little volume has laid the foundation for a full record of the services of a regiment which, raised nearly 100 years ago, has taken part in many of our wars, and has gained renown therein.

Napoleon at St. Helena. By Barry Edward O'MEARA, his late Surgeon. In two vols. London: Richard Bentley and Son, 1888. Pp. 739. Size 9" x 6" x 4". Weight under 5½ lbs. Price 30s.

The first edition of the work appeared in 1822, and we are told in a note by the publishers that when issued at that time by Messrs. Simpkin, Marshall, and Co., the interest excited by it was so great on the part of the public that the predecessors of the City police were called into requisition and posted round Stationers' Hall Court to keep off the crowd. Since the publication of the earlier editions several important works have appeared, such as *De Remusat and Metternich*, also the narrative of Baron Sturmer, and *The Life of Governor Lowe* by Forsyth. Considerable alterations and additions have been therefore made, and the bulk of the notes throughout the work are new.

Notes on Armour and the Artillery Defence of a Coast Fortress. By Major BUNBURY, R.A., Military Instructor, N.S.W. Sydney: C. Potter, 1888. Pp. 84. Size 9½" x 6" x ½". Weight under ¾ lb.

These notes are compiled for the use of the New South Wales Artillery. The author has endeavoured to ascertain the probable solution of the problem not yet submitted to practical test: an engagement between a modern powerful fleet and a modern first-class fortress, and to show how the results of the theories on the subject might be practically applied to the service of ordinary coast batteries, such as those existing in the Colonies. In the appendix he has given some illustrative examples of a very interesting character.

Messrs. Clowes and Sons have published a series of useful little manuals, drawn up by Captain Malton, in connection with the New Field Exercise. It comprises:—*A Manual for Majors and Adjutants on Drill and Manœuvres, with Shelter Trench Exercises, Funerals, Encampments, &c.* Price 1s.

One on Brigade Drill and Attack Formations. Price 2s., post free.

A Key to Infantry Drill, 1889 (inscribed by permission to Lord Wolseley). Price 1s. 6d.

The Duties of Markers in Drill. Price 6d.

A 13th Edition of Sinnott's *Catechism on Infantry Drill*, adapted to the Present Regulations, with Questions on Manœuvre and Miscellaneous Subjects. Price 3s., post free.

From the same firm comes a similar little work, *Physical Drill with or without Arms, and the New Bayonet Exercise.* By Lieut.-Colonel G. M. Fox (dedicated to the Commander-in-Chief). Price 1s. And finally:

Method of Instructing a Company Practically on Parade in Company Drill. By Captain F. C. RICARDO, Grenadier Guards. Price 1s.

Of a similar character is a little work of 165 pages, from the pen of Captain H. R. GALL (published by W. H. Allen, London), entitled, *Tactical Questions and Answers on the Infantry Drill Book*, 1889. Price 1s. *Company Drill Made Easy.* By W. GORDON. Price 1s. 6d., or 15s. per dozen. And *Physical Training Made Easy.* Price 1s. The latter two being published by Messrs. Gale and Polden, of Chatham.

History of the Corps of Royal Engineers. By Major-General WHITWORTH PORTER, late R.E. London: Longmans, 1889. 2 vols. Pp. 1071. Size 9" x 6" x 3½". Weight under 4½ lbs. Price 36s.

General Porter has made use of the leisure of a retired Officer to some purpose,

and has with a great expenditure of time and labour drawn up an admirable history of the corps in which he has served.

Internal Ballistics. By J. A. LONGRIDGE, M.Inst.C.E. London: Spon, 1889. Pp. 240. Size 9" x 6" x 1". Weight under 1 lb. 10 ozs. Price 18s.

The author deals in this book with Explosive Substances in general, Fired Gun-powder, M. Sarrau's Formulae, Internal Ballistics in relation to Gun Construction, and Guns considered as Thermodynamic Machines. He maintains that theory and sound practice are not nor ever can be divergent, and his object is to assist in removing the incubus of empiricism from artillery science.

Gibraltar. By H. M. FIELD. London: Chapman and Hall, 1889. Pp. 139. Size 9" x 6" x 1". Weight under 1 lb. 10 ozs. Price 7s. 6d.

The book is the result of a visit of one of our American cousins to Gibraltar, but The Rock is such well-trodden ground, that any record of a visit to it now-a-days cannot reveal anything new.

Through the Heart of Asia over the Pamir to India. By GABRIEL BONVALOT, with 250 illustrations by ALBERT PEPIN. Translated from the French by C. B. PITMAN. London: Chapman and Hall, 1889. 2 vols. Pp. 530. Size 10½" x 7" x 2". Weight under 4 lbs. 8 ozs. Price 32s.

"I can see nothing calculated to check the advance of a people whose sources of energy and action are increasing each day, as its population grows, and as it gains confidence in its own strength and knows how to use it. Besides this, the Russians do not disseminate their forces any more than a tree does when it drops its fruit and sows its seed, and they are ever pushing forward the same frontier, so to speak, by the inward pressure of the sap. All this causes deep concern to those whom we encountered upon the other side of the mighty mountain chain." Such are some of the reflections of the travellers who, starting from Tiflis and proceeding by Meshed and Bokhara to Kokand, returned across the Pamir to Rawal Pindiee.

Records of the Royal Horse Artillery from its Formation to the Present Time, being the revised edition of the *Records of the Horse Artillery.* London: Mitchell and Co., 1888. Pp. 277. Size 11" x 9½" x 1¼". Weight under 3½ lbs. Price 5s.

The original edition was the work of the late Major-General J. E. Mitchell, and the present one has been undertaken and carried through by his widow.

Les Méthodes de Guerre actuelles et vers la fin du XIXme Siècle. Par le Général PIERRON. 2e Ed. Tome Première. 11me Partie. Paris: Librairie Militaire de L. Baudoïn, 1889. Pp. 774. Size 7½" x 5" x 1¼". Weight under 1 lb. 6 ozs. Price 6 fr. 30 c.

Nearly 800 pages of a most marvellous encyclopædia.

Charles George Gordon. By Colonel Sir WILLIAM F. BUTLER. London: Macmillan and Co., 1889. Pp. 255. Size 7½" x 5" x ¾". Weight under 1 lb. Price 2s. 6d.

This admirably written little book is an excellent introduction to the series of English Men of Action which began in February last, and will be continued monthly. Judging from the list of authors of the rest of the series the standard set up in the first volume will be maintained, but it is a high one.

Works on Horses and Equitation: A Bibliographical Record of Hippology. By F. H. HUTH. London: Quaritch, 1887. Pp. 429. Size 9" x 7" x 1¼". Weight under 2½ lbs. Price 21s.

This is a very useful work, in the compilation of which Captain Huth has derived assistance from the notes on the subject drawn up by Captain Elliot. Some 4,000

works in many languages are arranged in order of publication from 430 B.C. to 1886 A.D. Besides this list is an index to names of authors and one to subjects. The book is one of very great value.

Rapid Field Sketching and Reconnaissance. By Captain W. VERNER, Rifle Brigade, D.A.A.G. for Instruction, S.E. District. London: Allen, 1889. Pp. 87. Size 10" x 6½" x ¾". Weight under 1 lb. 6 ozs. Price 7s. 6d.

Captain Verner has had a great deal of practical experience of this subject, and has given us a most readable and useful book in connection with it.

Roaring in Horses: Its History, Nature, Causes, Prevention, and Treatment. By G. FLEMING, C.B. London: Baillière, 1889. Pp. 160. Size 9" x 5½" x ¾". Weight under 1 lb. 2 ozs. Price 6s.

Coming from so high an authority as Mr. Fleming, this book will at once receive from all interested in horseflesh the attention it deserves.



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THE COUNCIL of the ROYAL UNITED SERVICE INSTITUTION are desirous of obtaining the assistance of OFFICERS of the NAVAL and MILITARY SERVICES in carrying out the Courses of Lectures at the Institution.

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